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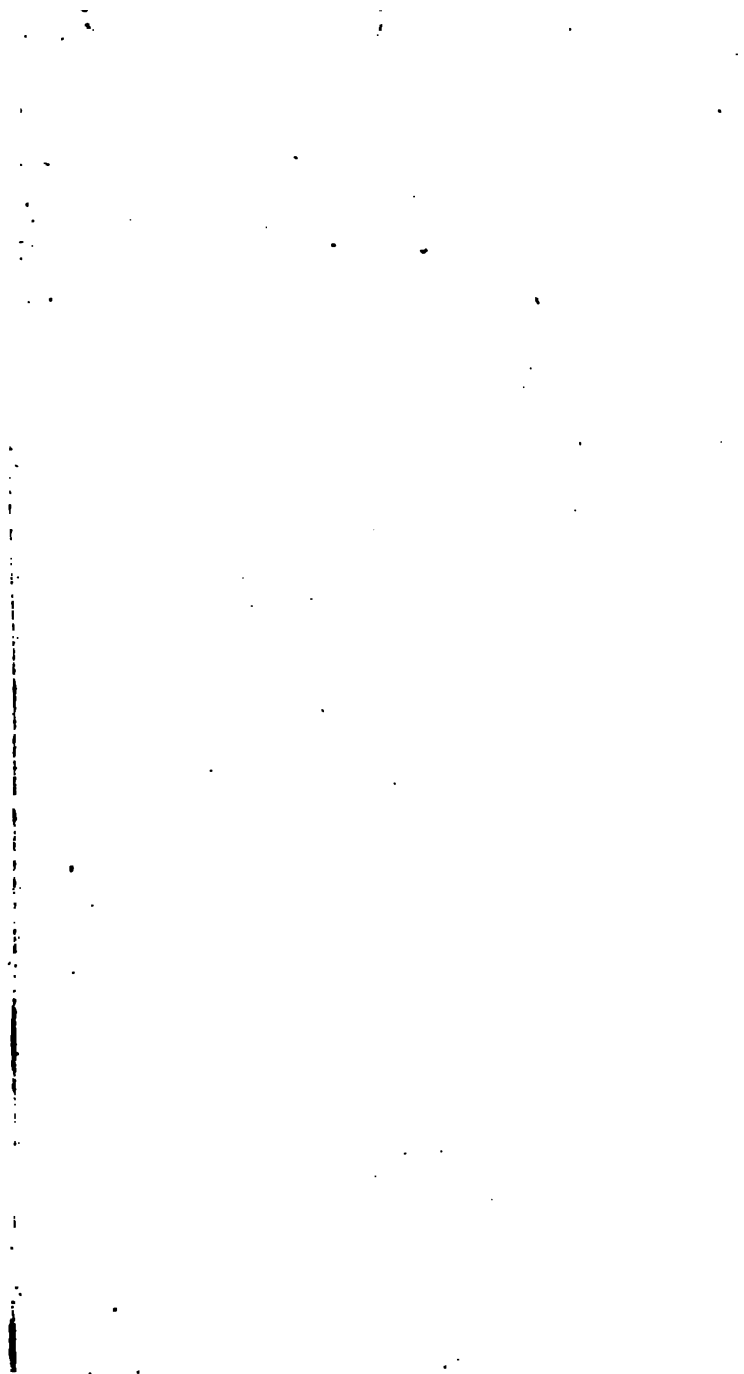
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**A**

# **HAND-BOOK OF SURGERY**

**FOR**

**STUDENTS AND PRACTITIONERS**

**BY**

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TO

DR. EDWARD MARTIN

AND

DR. JOHN A. WYETH

TWO SURGEONS WHOSE WORK IS AN INSPIRATION TO ME



## PREFACE.

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THIS book is intended to serve as a working guide for the student and general practitioner. The author has attempted to present a brief outline of the principles and practice of surgery, giving the essentials of the subject in as concise a manner as is consistent with clearness. Whatever has been found of practical value and has been accepted by surgeons during the years of its preparation has been included.

NEW YORK, August, 1904.



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# A HAND-BOOK OF SURGERY.

## CHAPTER I.

### EQUIPMENT.

A SURGEON, to be prepared for all kinds of general and special work, will require the following outfit:

**General.**—Operating table, instrument and dressing table, sterilizer (for instruments, dressings) (Fig. 1), instru-

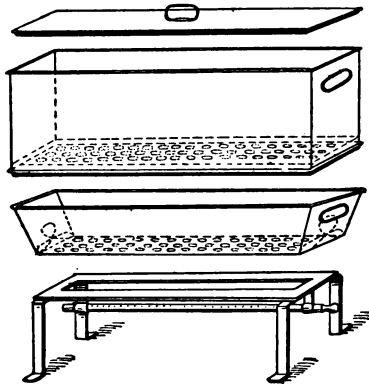


FIG. 1.—Sterilizer for instruments and dressings.

ment tray (of glass or agate-ware), wash-bowls (3) of glass or porcelain, measuring-glass, graduate (glass) ℥viiiij (256 c.c.), slop-pail (of metal or agate-ware), pus-basin, irrigator (Fig. 2), surgical cushion (pneumatic rubber draining pad), footrest (stirrups) or knee-crutch, hand-brush,

towels (12), sheets (4), blankets (2), operating gowns (1 long-, 2 short-sleeved), rubber apron, and gloves.

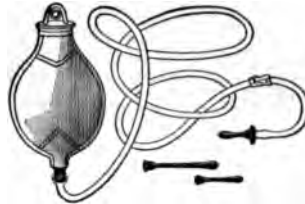
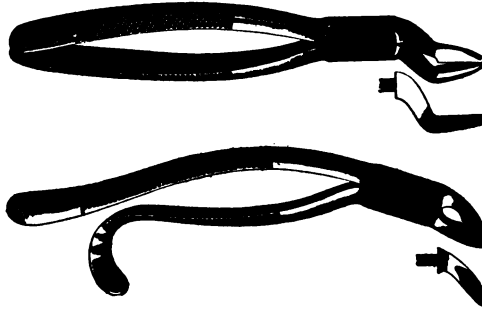


FIG. 2.—Fountain syringe.

**Instruments.—General Operating.**—Hemostatic forceps (18), scalpels (two sizes), amputating knife (medium), curved



FIGS. 3, 4.—Extracting forceps.

bistoury (sharp-pointed), tenotome, hernia knife, dissecting forceps, splinter forceps, extracting forceps (Figs. 3 and 4),



FIG. 5.—Grooved director, eyed (to enter deep-seated pus collections by being passed down the aspirating needle used as a guide) (original).

scissors (straight, curved, bandage), grooved director (eyed) (Fig. 5), curet (Volkman's sharp spoon), trocar and can-

nula, tenaculum, probes (blunt-pointed, eyed, sharp), saws (amputating, Hey's (Fig. 6), Gigli's (Fig. 7)), mattress-pins (2 small, 2 large), mallet (wooden) (Fig. 8), trephine, bone-



FIG. 6.—Hey's saw.

forceps (gouge, rongeur, lion-jawed, cutting), periosteal elevator, chisels (gouge, straight), retractors (2 dull, 2 sharp-pointed,



FIG. 7.—Gigli's chain saw.

2 abdominal), obstetric forceps, wooden mouth-screw or wedge (Figs. 65, 66), mouth-gag tongue-depressor, horse-hair probang (coin-catcher), esophageal bougies, stomach-



FIG. 8.—Author's one-piece wooden mallet.

tube, tracheal tube, Esmarch tourniquet tube (preferable to the elastic strap tourniquet because pressure effects are not so frequent after prolonged application), (Fig. 9),

sponge-holders (3), vulsellum forceps, machine drill (assorted drills) (Fig. 10), awl, aneurism needle, needles (12 assorted, curved, straight, Hagedorn), Paquelin cautery (Fig.



FIG. 9.—Martin's rubber bandage for use in varicose veins, gonorrheal rheumatism, in conjunction with Esmarch tube for bloodless operating.

11), intubation set, bandage-roller, microscope (having an immersion-lens and magnifying power of 1000 diameters, also good light condenser), stethoscope, inhalers, syringe

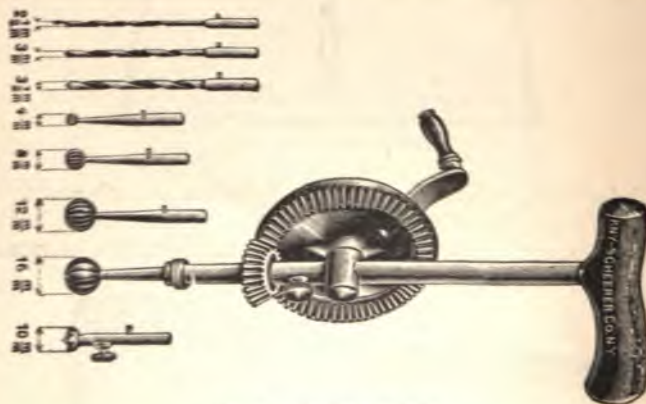


FIG. 10.—Machine bone drill.

(hypodermic, aspirating) with fine and coarse needles, razor, tape-measure, clinical thermometer.

**Pocket-case.**—Hemostats (4), scissors (curved), dissecting forceps, splinter forceps, grooved director (eyed), probe,

spoon curet, scalpel, curved (sharp-pointed) bistoury, hernia knife, soft-rubber catheter (No. 10 French scale), needles (3) curved, straight, catgut, and silk (sterile package).

**Special Instruments.**—*Eye.*—Lens (double convex), ophthalmoscope (Fig. 12), speculum, cataract knife, strabismus hook, probes, iris forceps, fixation forceps, keratome, cystotome, horn spoon, wire loop.

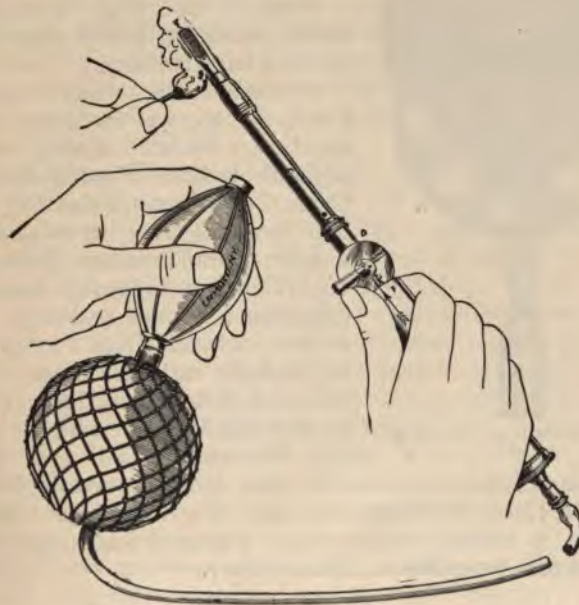


FIG. 11.—Improved thermocautery.

*Nose, Throat, and Ear.*—Head mirror, Argand burner or Welsbach attachment with a tin hood having a side aperture, specula, Politzer bag, Eustachian catheter, throat mirror (thin white glass with strong frame), tonsillotome, 2 probe-pointed knives (short, long), curved double-edged knife, 2 cotton applicators (nasal, throat), atomizer (having a long nozzle), powder-insufflator, polyp-forceps, snare, 2 nasal saws



(short, long), crocodile forceps, angular forceps, angular scissors, diagnosis tube.

*Gynecology.*—Tents (3), bougies (dilating set), vaginal speculum (medium bivalve), uterine sound, applicator, gauze packer (Fig. 13), 2 dull curets (medium, small), uterine syringe, 2 pairs of scissors (right and left curved on the flat).

*Rectal.*—Speculum, bougies (small, medium), pile-clamp, rectal dilating bag (rubber).

*Genito-urinary.*—Steel sounds (Nos. 14 to 32 inclusive, even numbers, French scale), olive-pointed flexible French bougies (Nos. 6 to 16 even numbers), bulbous bougies (Nos. 16 to 30 even numbers), staff (stricture guide No. 10), filiform bougies (6), tunneled catheters (Nos. 10 and 14), soft-rubber catheters (Nos. 12, 14, and 18), metallic catheters (Nos. 14 and 18), French flexible catheters (Nos. 12 and 14), Mercière catheter (No. 18), lithotrites (small and large

sizes), evacuator, lithotomy forceps, scoop, prostatic (blood) catheter (No. 18), stone-searcher (No. 12), deep urethral syringe, 3 irrigator tips (glass), 2 glasses (discharge test), urinometer, 6 test-tubes, litmus-paper.



FIG. 12.—Loring's ophthalmoscope.



FIG. 13.—Gauze packer.

**Sutures.**—Silk, silkworm gut, horsehair, catgut (plain and chromicized, assorted sizes), silver wire, kangaroo tendon. Catgut sutures run in sizes from No. 0 to No. 12, most surgeons preferring small sizes for their work.

**Dressings.**—Gauze (for use as sponges, pads, and dressings), cotton (a supply of cotton batting and absorbent cotton), oakum (made from old tarred hemp rope is a useful dressing in chronic suppuration), rubber tissue, roller-bandages (both gauze and muslin of the following sizes: 1 inch (25 mm.) by 3 yards (2.74 m.); 2 inches (51 mm.) by 6 yards (5.48 m.); 2½ inches (63.5 mm.) by 8 yards (7.2 m.); 3 inches (76 mm.) by 9 yards (8.2 mm.); 4 inches (10 cm.) by 10 yards (9 m.), splints, plaster-of-Paris.

**Drugs and Reagents.**—Chloroform, ether, cocain hydrochlorate (in tablet form for making fresh sterile solutions), bichlorid of mercury tablets, carbolic acid, nitric acid, Fehling's solution (for urinalysis), sodium carbonate (washing-soda), alcohol, turpentine.

**Operating Room.**—Should be large, in the highest part of the building (fewest number of floating germs), well lighted from the south, and ventilated (open fire-place is desirable), exposed to sun, well warmed in winter, secure a constant temperature of 75° F. (23.8° C.) to 85° F. (29.6° C.) Running water is desirable, but contamination of the atmosphere may occur from the drain-pipes. The operating room should be near that of the patient. It should be thoroughly cleaned, and it is desirable to remove all hangings, carpets, rugs, ornaments, clothing, and unnecessary furniture. In emergency use a floor cloth of sheets, dampened newspapers, or oil-cloth. Use plain wooden tables and chairs; clean the room by—(1) Scrubbing (hot water and soda, carbol soap) all the floor and woodwork; (2) mop or sponge floors and woodwork with solutions of mercury bichlorid (1 : 500); carbolic acid (1 : 40); creolin (1 : 50); lysol (1 : 50); chlorid of lime (1 : 100). For the side walls and ceilings use a similar means, or when there is danger of spoiling the walls employ a moistened dust-cloth, dry cloth, or rye-bread crumbs, and hang sheets which have been wrung out dry in mercury bichlorid (1 : 1000) about the room. Sheet the lower window-sashes. Prepare the room the day before operation; close tight until used. In emergency clean a room by steaming for one hour, closing the doors and windows and securing a supply of live steam



by means of active boiling water in an open dish-pan or wash-boiler.

**Patient's Room.**—Secure quiet and similarly arranged room as for operation. Have no unnecessary furniture. The room should be away from stationary wash-stands or lavatories (any advantages from the presence of these are counterbalanced by the danger from being sources of contamination). Screen the bed. Remove at once from the room unused food, water, milk, or any form of drinking fluid, dressings, discharges, urine, feces, medicines.

**Care of Implements.**—Instruments, whether metal or wooden, before using should be boiled for from five to fifteen

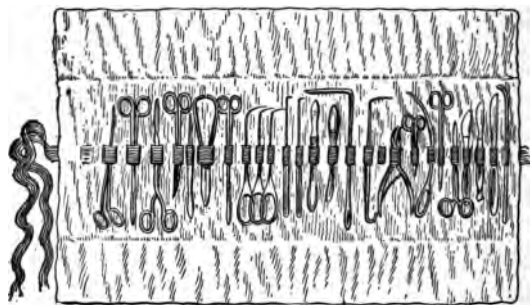


FIG. 14.—Canton-flannel roll for instruments.

minutes in a 1 per cent. carbonate of sodium solution (washing-soda) prevents rusting and is also slightly antiseptic. Approximate the strength by adding soda until the water imparts a sense of greasiness to the touch; drain; place for use upon a sterile towel or in a tray of carbolic solution (1 : 20). Clean instruments during operation by boiling, rinsing in sterile water or carbolic solution (1 : 20). After operation—(1) Scrub in cool water (dissolves blood-stains better than when warm or hot); (2) continue with soap and water; (3) boil five minutes; (4) drain; (5) oil the locks. Dry complicated instruments by dipping in alcohol, or they may be placed in an oven for a few minutes. Cracking of wooden instruments may be prevented by frequent oiling, the lubricant being well rubbed into the wood.

**Rubber Implements.**—Wash in Castile-soap lather, rinse, drain, dry, sprinkle with talc, and keep in air-tight case.

*Gloves* may be boiled if wrapped in gauze with fluffed gauze in each finger to prevent sticking.



FIG. 15.—Instruments wrapped in canton-flannel roll.

A dusting-powder for use with rubber gloves (preventing perspiration):

- R. Aluminum sulphate,  
     Boric acid . . . . . aa  $\overline{3}$ ss (16 gm).  
 M. Finely pulverize.

*Rubber Glove Solution.*—Murphy suggests an aseptic film covering sufficiently tenacious to last during several hours' work, to be made by dipping the hands and arms into a 4 to 8 per cent. solution of pure gutta-percha chips dissolved in sterile benzin or acetone (use chloroform or carbon tetrachlorid in place of these, owing to inflammability). The solution may not be boiled. Apply by immersion, allowing excess to drip from the fingers; the acetone solution dries in a few seconds; that of benzin requires two or three minutes. Remove from the skin, which is left pliant by washing in benzin.



FIG. 16.—Sterile catheter holder.

*Catheters, Stomach, and Rectal Tubes*—Boil from five to fifteen minutes to render absolutely sterile, drain, dry, keep in straight position (rubber catheters may be kept sterile in holders made from thick glass tubing of suitable length

fitted with corks) (Fig. 16); atomizer bulbs and soft-rubber tips must be thoroughly dried after use and kept air-tight.

*Rubber tissue* should be kept moistened in carbolic solution (1:40) in covered-jars. Oil or greasy lubricants, alcohol, ether, and chloroform destroy rubber. May use formaldehyd as sterilizing agent (special apparatus required, or burn wood-alcohol in spirit-lamp in a closed chamber containing the article to be sterilized). Whalebone instruments (filiform bougies) roughened by wear may be smoothed by rubbing with fine emery cloth. *A good lubricant for catheters and for general use* is made as follows:

R. White Castile soap (pulv.) . . . . .	℥i (32 gm.)
Water . . . . .	℥iij (96 gm.)
Mucilage of Chondrus crispus . . . . .	℥iij (96 gm.)
Formalin (40 per cent.) . . . . .	℥x (0.666 c.c.)
Thymol . . . . .	gr. v. (0.333 gm.)
Oil of thyme . . . . .	℥v. (0.333 c.c.)
Alcohol . . . . .	℥xv. (1 c.c.)

Heat the soap and water, stirring into a syrup; add the Chondrus crispus (made of the strength of one ounce of Chondrus crispus to the pint of water). Cool, add the formalin, then the thymol, and oil of thyme mixed with the alcohol; stir, strain, and keep covered until air-bubbles vanish. Put up in two-ounce collapsible tubes and sterilize (Gouley).

*Carbol soap* (for general use for instruments (not rubber), floors, woodwork, sheets, blankets, gowns) consists of:

R. Soft-soap . . . . .	3 parts.
Carbolic acid (commercial) . . . . .	3 "
Water . . . . .	100 "
M. Heat, stir.	

**Disinfection (Sterilization).**—*Definition.*—The process of destroying bacteria.

**Germicides.**—A germicide is a chemic agent which destroys germ-life; as, bichlorid of mercury, carbolic acid, creolin, lysol, mustard.

**Antiseptics.**—An antiseptic is a substance detrimental to germ growth (may or may not kill the micro-organisms). As hydrogen dioxid, iodoform, formaldehyd, silver, acetanilid.

**Asepsis.**—*Definition.*—Asepsis is a condition of absence or nullity of action of hurtful germ-life.

**Sick-room Disinfection.**—To disinfect a room after con-

tagious disease or in times of epidemic complicating surgical work employ the following methods, combined or singly: (1) Close the room, sealing door and window cracks with cotton caulking or by means of pasted paper strips or adhesive plaster for a period of two days. (This secures sediment disinfection or a settling of floating germ-life.) (2) Mop off flat surfaces with cloth wrung out in bichlorid (1 : 500), carbolic (1 : 40), acid bichlorid (1 : 500). (3) Fumigate with sulphur candles (use 2 pounds (1024 gm.) for every 1000



FIG. 17.—Schering's formalin lamp.



FIG. 18.—Formaldehyd generator.

cubic feet (28.36 cu.m.) of room space—secures nearly 2 per cent. by volume of sulphur dioxid gas), room tightly closed meanwhile; will be more effective in the presence of moisture (vessel of boiling water or sponge off walls) (sulphur dioxid with water forms sulphurous acid, which is the disinfectant); chlorin gas; formalin (wood-alcohol burned in a spirit-lamp) (Fig. 17), or formaldehyd by special apparatus (secures one volume of vapor to 300 of room space) (Fig. 18). Moist atmosphere increases the value of all disinfect-



ants. The gases may be blasted into the room with steam. Scrub the room floor, side walls, and ceiling with one of the following: carbol soap, hot water, and soap; hot bichlorid (1 : 500); carbolic (1 : 20 to 1 : 40). Whitewash, paint, or repaper. Secure open ventilation for from two to four days ("atmosphere disinfection") before occupying.

**Clothing, Dressing, Bedding.**—To disinfect such articles soak them in a tub of carbol-soap solution, hot bichlorid (1 : 1000) or carbolic (1 : 40). *Moist heat* may be employed (steam in five minutes' time will penetrate all through a bale of cotton).

**Method.**—(a) Streaming steam in the form of compressed steam in sterilizers; (b) intermittent, moist heat at intervals of twelve to twenty-four hours for the destruction of latent spores. Infected articles may be transported with safety if wrapped in a sheet soaked and wrung out in carbolic solution (1 : 20) or in bichlorid (1 : 500).

**Stools, Discharges.**—Treat discharges and evacuations with milk of lime (whitewash) or chlorid of lime (2 ounces (64 gm.) to an ordinary evacuation). To be efficient, the disinfectant must be well stirred up with the fecal masses or discharge. (Stoppage of waste-pipes may occur, owing to precipitation of lime.)

**Disinfection Aboard Ship (Maritime Quarantine).**—Vessels to be cleaned hailing from all ports before taking cargo or passengers:

*For iron hulls:* After a thorough scrubbing with carbol soap apply from a hose acid bichlorid of mercury solution:

R. Bichlorid of mercury . . . . .	1 part.
Hydrochloric acid . . . . .	2 parts.
Water . . . . .	800 parts.—M.

Treat the hold and cargo to sulphur dioxide fumes of 10 per cent. by volume (this percentage is obtainable only by using liquid gas from tanks or by employing a special furnace) for forty-eight hours.

*For wooden hulls:* Scrub with carbol soap, sulphur dioxide 10 per cent. following in seventy-two hours with acid bichlorid flushing. Repaint or whitewash throughout. Per-

sonal effects of crew and passengers are to be treated to streaming steam and carbolic solution (1 : 20 to 1 : 40).

**Dead at Sea.**—The body is not to be washed, but after being wrapped in a sheet wrung out in either carbolic acid solution (1 : 20) or acid bichlorid of mercury (1 : 500) is to be buried or hermetically sealed in a lead-lined casket.

## CHAPTER II.

### BANDAGING AND MINOR SURGERY.

#### HEAD.

SECURE the initial end of a bandage when applying by making three circular (overlapping) turns about the limb or part which is to be covered. Fasten the extremity by means of another bandage, safety pins, by tearing up the end in two, reversing and tying about the part, narrow adhesive strap, or by stitching at the crossing points of the bandage.



FIG. 19.—Figure-of-eight of one eye.

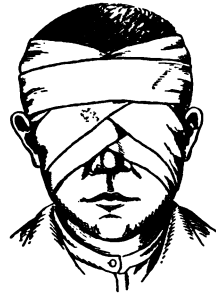


FIG. 20.—Figure-of-eight of both eyes.

For head bandaging use a roller 2 inches wide by 6 yards long.

**Circular Turns.**—This bandage may be used to cover the forehead, temporal regions, or the sides and base of the scalp.

**Circular with Oblique Turns** (Figs. 19, 20).—May be used to cover one or both eyes; scalp.

**Circular with Recurrent.**—Is used to cover whole of scalp (Fig. 21).

**Circular ; of Forehead.**—Covers the occiput, neck, or base of the skull.

**Circular ; Occiput, Forehead** (Fig. 22).—Reversed



FIG. 21.—Recurrent bandage of the head.



FIG. 22.—Crossed bandage of the angle of the jaw.

over temporal region, crown to under jaw. Covers the lower jaw and the parotid region.

**Circular.**—Occiput to forehead, reversed over the temporal region, circular and oblique, crown to under jaw. Covers the cheek and side of the face.

**Barton's** (Fig. 23).—Used for fracture and dislocation of the jaw. Figure-of-eight turns beginning just behind the



FIG. 23.—Barton's bandage, or figure-of-eight of the jaw.



FIG. 24.—Gibson's bandage.

mastoid process with alternating circular turns from the occiput to the chin.

**Modified Barton's.**—Use to obtain greater security. Add circular turns from the occiput to the forehead.



**Gibson's** (Fig. 24).—Use for fracture or dislocation of the lower jaw. Three circular turns from the crown (vertex) to lower jaw; reverse, three circular turns temporal region, occiput to forehead, three circular turns occiput to chin; reverse and make a last turn from occiput to forehead.

**Handkerchief or Four-tailed Bandage** (Fig. 25).—*Use.*—For fracture or dislocation of the lower jaw, to retain dressings.

**Author's Head Bandage** (Fig. 26).—A simple retaining bandage for dressings about the angles of the jaw and



FIG. 25.—Four-tailed bandage for the jaw.



FIG. 26.—Author's head bandage.

adjacent neck region may be made from a yard length of a three- or four-inch roller. The bandage is applied by laying it against the dressing in place. The ends are then drawn up upon each side of the patient's head. A two-tailed end is made from each by tearing down the middle until the level of the lobe of the ear is reached. The four tails are then to be drawn taut, crossed, and tied over the vertex.

#### NECK.

Roller, 2 inches wide, 5 yards long.

**Circular.**—*Circular* with *oblique* turns. *Circular* with

*figure-of-eight* turns about the *axilla* (Fig. 27).—*Uses*.—To retain dressings to the neck or axilla.

### CHEST.

Roller, 3 inches wide, 10 yards long.

**Spiral Bandage of the Chest.**—*Use*.—To secure dressings to the chest, temporary dressing for fracture of



FIG. 27.—Figure-of-eight bandage of neck and axilla.

the ribs. Apply circular turns with oblique (spiral) turns until the chest is covered; final turn (for support) over the shoulder and down the front of the chest.

**Anterior Figure-of-eight Turns.**—*Use*.—Covers the front and upper parts of thorax. Circular turns from



FIG. 28.—Figure-of-eight bandage of the breast.



FIG. 29.—Gauntlet bandage.

axilla across the chest (to fix the bandage); figure-of-eight turns from behind the shoulder up and over, crossing anteriorly to the other side of the body.

**Posterior Figure-of-eight Turns.**—*Use.*—Fracture of the clavicle or dislocation. To hold dressings to back of the chest. Oblique turns from one shoulder, across the back to the opposite axilla, thence anterior up and over the shoulder with figure-of-eight turns to the other side of the body.

**Bandage for Support and Compression of the Breast** (Fig. 28).—Circular turns (oblique) from the scapula of the sound side, across the back, to axilla, beneath the breast, over the shoulder to point of starting. Alternate with circular turns about the thorax. By repeating the turns both breasts may be supported.

#### UPPER EXTREMITY.

Roller,  $2\frac{1}{2}$  inches wide, 7 yards long.

Roller, 2 inches wide, 6 yards long, for hands, wrist and elbow.

**Fingers.**—Roller, 1 inch wide, 3 yards long for fingers.

**Circular with Oblique (Spiral) Turns.**—*Use.*—To retain dressings or splints. For additional support apply one or two circular turns to the wrist.

**Gauntlet Bandage of the Hand** (Fig. 29).—*Use.*—Covers back of hand and all of the fingers. Circular turns to the wrist (fixes), oblique turn across the back of the hand to the little finger; cover in by circular, oblique (spiral) and recurrent turns; return to the wrist by an oblique and circular turn; cover remaining fingers and the thumb. Complete by a circular turn to the wrist.

**Back of Hand (Demi-gauntlet)** (Fig. 30).—*Use.*—To secure dressings to either the back or palmer (by reversing) surfaces of the hand. Fix by circular turns about the wrist. Continue with an oblique turn across the back of the hand to the base of the little finger, circle the finger, return to the wrist. Complete by similar turns to the remaining fingers and thumb with a final circular turn of the wrist.

**Spica of Thumb** (Fig. 31).—*Use.*—To retain dressings or splints. Circular turns of the wrist to fix. Continue by an oblique turn to the tip of the thumb, circular with



an oblique turn to the wrist. Continue by repeating until the thumb is entirely covered. Complete by a circular turn around the wrist.

**Spiral Reversed of the Upper Extremity** (Fig. 32).

—*Use*.—To cover the arm, forearm, and hand. Fix by cir-



FIG. 30.—Demi-gauntlet bandage.



FIG. 31.—Spica of the thumb.

cular turns at the wrist. Cover the hand by circular and oblique turns (spiral or spiral reversed); with figure-of-eight turns about the base of the thumb and the wrist. Cover the arm by ascending circular with oblique (spiral reversed and spiral) turns to the elbow which is covered in by figure-



FIG. 32.—Spiral reversed bandage of the upper extremity.



FIG. 33.—Figure-of-eight bandage of the elbow.

of-eight turns. Complete by circular (oblique, spiral, and spiral reversed) turns to the axilla.

**Elbow.** — **Figure-of-eight** (Fig. 33). — *Use*. — Dressings about the elbow. Allows motion without derangement of the dressing. Fix by circular turns just below the elbow. Continue by an oblique turn across the front of the joint to

the upper arm. Complete by circular turn with a return across the joint to the starting-point. Continue, covering in two-thirds of the previous turn laid down, until the parts are entirely covered.

**Spica of the Shoulder (Descending).**—*Use.*—To retain splints and dressings about the shoulder. Circular turns about the arm at the level of the axilla (to fix); oblique turn across the shoulder, base of the neck, about the opposite axilla to the back. Complete the turn by crossing the first turn at the base of the neck. Continue until the parts are covered (each turn overlapping two-thirds of the previous one).

**Spica of the Shoulder (Ascending)** (Fig. 34).—Circular turns around the arm at the level of the axilla (to fix).

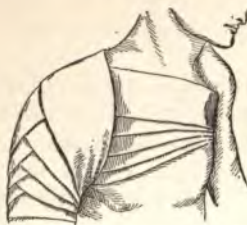


FIG. 34.—Ascending spica of the shoulder.



FIG. 35.—Velpeau's bandage.

Continue by an oblique turn across the chest to the opposite axilla, return across the back to starting-point. Continue by repeating these turns (ascending by overlapping preceding turns two-thirds).

**Velpeau Bandage** (Fig. 35).—*Use.*—Fracture of clavicle and scapula; dislocation of the humerus. Place the fingers of the affected side upon the sound shoulder (prevent the skin surfaces coming in contact by means of gauze, towel, dusting-powder). Commence the application of the bandage from the scapula of sound side, continue with a turn over the shoulder of the affected side, anteriorly down the arm, behind the elbow; across the front of the chest to the sound axilla; thence to the point of starting. Repeat (to fix). After the second turn carry the bandage trans-

versely around the chest, over the flexed arm, near the elbow. Continue by alternating circular turns (ascending spirally) with turns similar to the fixation turns.

**Desault Bandage.**—*Use.*—Fracture of the clavicle.



FIG. 36.—Desault's bandage, first roller.



FIG. 37.—Desault's bandage, second roller.

First Roller (Fig. 36): Elevate slightly the arm of the affected side; place a pad in the axilla, secured by circular turns (spiral) with figure-of-eight about the opposite shoulder (to fix). Complete by covering in the chest with circular oblique turns.



FIG. 38.—Desault's bandage, third roller.



FIG. 39.—Double spica of the groin.

Second Roller (Fig. 37): Lower the arm of the affected side; flex the forearm (to a right angle) across the front of the chest. Bind the arm to the chest by circular turns (spiral) from the shoulder to the elbow.

Third Roller (Fig. 38): Forms two triangles if correctly



oblique, spiral reversed turns until the instep is reached. Continue by oblique turns, covering in the heel. Complete by ascending, oblique, circular turns above the ankle.

**To Cover the Heel (American Method)** (Fig. 42).—Circular turns (3) about the ankle (to fix); descend by oblique turn across the back of the foot; circular turn at the base of the toes. Continue by covering the foot with ascending spiral reversed turns until the instep is reached. Cover the heel by circular turns from the instep to the heel, alternating with figure-of-eight turns about the sides of the heel. Complete by circular turns, ascending the ankle.

**Bandage of the Foot Not Covering the Heel (French)** (Fig. 43).—Circular turns (3) at the ankle (to fix).



FIG. 41.—Spica of the instep.



FIG. 42.—Method of covering the heel.



FIG. 43.—Figure-of-eight bandage of the instep.

Oblique turn across the back of the foot, descending to the base of the toes, where a circular turn is made. Cover in the foot to the instep with spiral reversed turns (ascending). Complete by circular turns about the ankle and lower leg.

**Complete Bandage of the Lower Extremity** (Fig. 44).—*Use*.—Compression to the leg to retain dressings. Circular turns (3) at the ankle (to fix); oblique turn, descending across the dorsum of the foot, with a circular turn at the base of the toes. Continue by covering in the foot and heel. Ascend the leg by circular, oblique, spiral, or reversed spiral, covering in the calf. Continue by figure-of-eight turns at the knee. Complete by ascending spiral or reversed spiral of the thigh.

**Figure-of-eight of the Leg.**—*Use.*—Compression; is not easily disarranged. Circular turns (3) about the ankle (to fix); oblique turn across the dorsum of the foot; circular turn at the base of the toes. Continue by covering in the foot. Ascend the foot to the ankle with oblique, spiral reversed turns. Ascend the leg to the top of the calf by an oblique turn across the front of the shin. Continue with a circular turn just below the knee; return to the ankle, crossing the previous turn on the line of the shin. Complete by repeating the oblique turns, covering two-thirds of



FIG. 44.—Spiral reversed bandage of the lower extremity.



FIG. 45.—Recurrent bandage of a stump.

the previous turn as you mount the leg. Finish with a circular turn just below the knee.

**Recurrent Bandage for a Stump** (Fig. 45).—(Roller,  $2\frac{1}{2}$  inches wide, 6 yards long.) Circular turns near the lower end of the stump (to fix). Ascend with oblique circular turns. Continue by recurrent turns, covering the end of the stump. Complete by ascending oblique, spiral, or spiral reversed turns, overlapping two-thirds of the previous turn.

**Spiral Reversed Bandage of the Penis.**—(Roller, 1 inch wide, 1 yard long.) Circular turns at the penoscrotal junction (to fix). Continue by an oblique turn to the glans; circular turns. Ascend the body of the penis by oblique,



applied (an anterior and a posterior). Oblique turns beginning in the axilla of the sound side, thence across the chest to the shoulder, around the shoulder to beneath the elbow. Return to starting-point. Repeat, alternating in front and behind. Complete the dressing by applying a sling.

#### ABDOMEN.

Roller, 4 inches wide, 9 yards long.

Circular with spiral turns. Binder; many-tailed binder (9 to 18 inches wide, 1 to 2 yards long). Uses—to secure dressings, and for support of the parts.

#### LOWER EXTREMITY.

Roller, 3 inches wide, 9 yards long.

**Spica of the Groin (Ascending).**—*Use.*—To secure dressings to the groin, upper portion of the thigh. Circular turns around the thigh (to fix). Continue by oblique circular turn just below the crest of the ileum of the sound side. Return to the starting-point. Repeat, ascending and covering two-thirds of the previous turn.

**Spica of the Groin (Descending).**—Circular turns about the thigh, high up (to fix). Continue by a circular oblique turn to the crest of the opposite ileum. Complete by returning to the affected side, crossing the first turn in the middle of the thigh. Repeat by circular oblique turns descending by overlapping two-thirds of the previous turn.

**Figure-of-eight Bandage of the Groin** (Fig. 40).—An emergency or provisional bandage may be quickly applied to the groin by passing the end of a three inch roller bandage about the body above the hips. Cross the ends over the center of the groin and reverse them, one passing above the thigh, the other behind to be tied upon the outer aspect of the limb.

**Double Spica of the Groins** (Fig. 39). Circular turns about the abdomen above the crests of the iliac bones. Continue by an oblique circular turn to and around the left thigh, across to the back of the abdomen, anterior with an oblique turn to the inner side of the right thigh, circular

turn; mount obliquely to the opposite side of the abdomen. Repeat until both groins are covered, overlapping two-thirds of previous turn at the crossing line in the middle of the thighs.

### KNEE.

Roller:  $2\frac{1}{2}$  inches wide, 5 yards long.

**Figure-of-eight Bandage of the Knee.**—*Use.*—For retaining dressings about the knee. Circular turns (3) about the leg below the knee (to fix). Continue by an anterior oblique turn across the front of the knee, mounting to the thigh; circular turn about the thigh; return by recrossing the knee, descending with an oblique turn. Repeat, overlapping previous turns two-thirds at the midline. Complete by covering in the parts entirely, finishing with circular turns.

**Figure-of-eight Bandage of Both Knees.**—*Use.*—Temporary dressing for fracture or dislocation of the thighs.

Circular turns about the legs at the level of the tops of the calves (to fix). Continue by rising obliquely across the front of the knees to the thighs; finish with a circular turn; return to the starting-point by a descending oblique turn across the front of the knees. Repeat, covering in two-thirds of the previous turns until the parts are entirely covered. Complete by right-angled turns about the bandage, by passing between the legs and thighs.



FIG. 40.—The Pryor inguinal bandage.

### FOOT.

Roller,  $2\frac{1}{2}$  inches wide, 6 yards long.

**Spica of the Foot** (Fig. 41).—*Use.*—Sprains, dressing to the foot. Circular turns (3) about the ankle (to fix); descend by an oblique turn across the back of the foot to the base of the toes, circular turn; cover the foot by ascending,

oblique, spiral reversed turns until the instep is reached. Continue by oblique turns, covering in the heel. Complete by ascending, oblique, circular turns above the ankle.

**To Cover the Heel (American Method)** (Fig. 42).—Circular turns (3) about the ankle (to fix); descend by oblique turn across the back of the foot; circular turn at the base of the toes. Continue by covering the foot with ascending spiral reversed turns until the instep is reached. Cover the heel by circular turns from the instep to the heel, alternating with figure-of-eight turns about the sides of the heel. Complete by circular turns, ascending the ankle.

**Bandage of the Foot Not Covering the Heel (French)** (Fig. 43).—Circular turns (3) at the ankle (to fix).



FIG. 41.—Spica of the instep.



FIG. 42.—Method of covering the heel.



FIG. 43.—Figure-of-eight bandage of the instep.

Oblique turn across the back of the foot, descending to the base of the toes, where a circular turn is made. Cover in the foot to the instep with spiral reversed turns (ascending). Complete by circular turns about the ankle and lower leg.

**Complete Bandage of the Lower Extremity** (Fig. 44).—*Use.*—Compression to the leg to retain dressings. Circular turns (3) at the ankle (to fix); oblique turn, descending across the dorsum of the foot, with a circular turn at the base of the toes. Continue by covering in the foot and heel. Ascend the leg by circular, oblique, spiral, or reversed spiral, covering in the calf. Continue by figure-of-eight turns at the knee. Complete by ascending spiral or reversed spiral of the thigh.



**Figure-of-eight of the Leg.**—*Use.*—Compression; is not easily disarranged. Circular turns (3) about the ankle (to fix); oblique turn across the dorsum of the foot; circular turn at the base of the toes. Continue by covering in the foot. Ascend the foot to the ankle with oblique, spiral reversed turns. Ascend the leg to the top of the calf by an oblique turn across the front of the shin. Continue with a circular turn just below the knee; return to the ankle, crossing the previous turn on the line of the shin. Complete by repeating the oblique turns, covering two-thirds of



FIG. 44.—Spiral reversed bandage of the lower extremity.

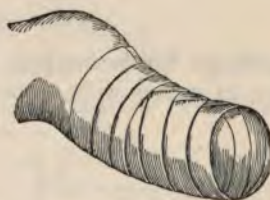


FIG. 45.—Recurrent bandage of a stump.

the previous turn as you mount the leg. Finish with a circular turn just below the knee.

**Recurrent Bandage for a Stump** (Fig. 45).—(Roller,  $2\frac{1}{2}$  inches wide, 6 yards long.) Circular turns near the lower end of the stump (to fix). Ascend with oblique circular turns. Continue by recurrent turns, covering the end of the stump. Complete by ascending oblique, spiral, or spiral reversed turns, overlapping two-thirds of the previous turn.

**Spiral Reversed Bandage of the Penis.**—(Roller, 1 inch wide, 1 yard long.) Circular turns at the penoscrotal junction (to fix). Continue by an oblique turn to the glans; circular turns. Ascend the body of the penis by oblique,

circular, or reversed spiral turns. Complete by circular and figure-of-eight turns about the base of the penis and scrotum.

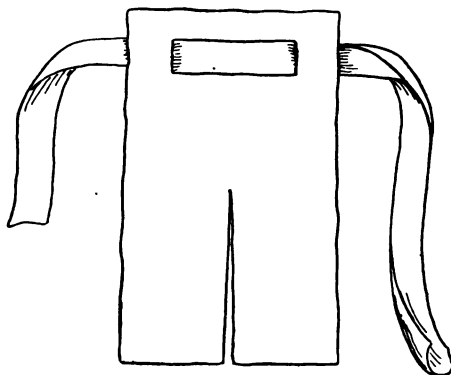


FIG. 46.—Perineal binder.

**Bandage for Securing the Lithotomy Position.**—(Roller,  $2\frac{1}{2}$  inches wide, 4 yards long.) Bring the patient's

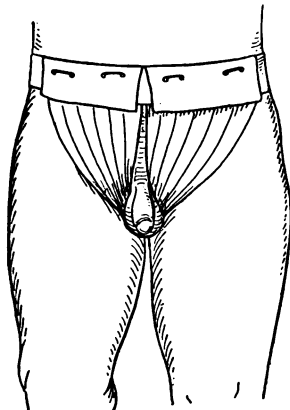


FIG. 47.—Perineal binder in position.



FIG. 48.—Modified Liebreich's eye bandage.

hand down to the side of his foot. Circular turns (3) around the wrist and ankle (to fix). Continue by alternating cir-

cular turns about the wrist and ankle. Repeat with the hand and foot of the opposite side. A rolled sheet twisted from opposite corners, passing under one shoulder over the other, and beneath the patient's knees, drawn up to his chest and tied, will answer the same purpose.

**Perineal Binder for Retaining Dressings to Perineum.**—(Roller, 8 inches wide, 4 feet long) (Figs. 46, 47).

**Liebreich's Eye Bandage** (Fig. 46).—(Strip of flannel, white or black,  $2\frac{1}{2}$  inches wide, 8 to 10 inches long, fitted with tapes at the extremities.) Apply to one eye obliquely, reverse the tapes by crossing at the occiput, circular turn, and tying. Apply to both eyes transversely with circular turn of the tapes and tie.

## MINOR SURGERY.

### ASPIRATION, TAPPING.

(Paracentesis.)

**Definition.**—Removal of fluid from a closed cavity of the body without the admission of air.

**May be Required for.**—(a) Tuberculous abscesses of the hip or spine (cold abscess); (b) hydrothorax; (c) empy-

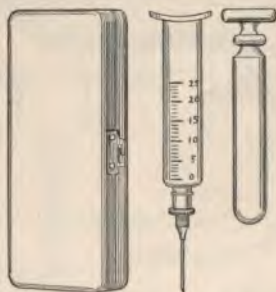


FIG. 49. —Luer's hypodermic syringe.

ema; (d) ascites; (e) diagnosis of tumors or concealed conditions; (f) arthritis; (g) overdistention of the heart.

**Implements.**—(a) Hypodermic needle and syringe (Fig.

49); (*b*) aspirating syringe (Fig. 50); (*c*) trocar and cannula which may be connected by tubing to a vacuum jar and exhaust-pump.



FIG. 50.—Schede's aspirator.

**Method.**—Prepare the skin surface as for an aseptic operation. Insert the needle or trocar—(*a*) avoid blood-vessels, nerves, important anatomic structures; (*b*) generally from below upward (aid flow by gravity); (*c*) until a sense of loss of resistance occurs. Prevent collapse in ascites by a tightening binder.

Suction of sufficient power to **withdraw subcutaneous joint or chest effusions** may be improvised.

*Implements.*—Two-quart glass jar having a small mouth;



FIG. 51.—Heat-vacuum aspirator (original).

a perforated cork fitted by glass air-tight connection with a two- or three-foot length of rubber tubing, which is joined to a sterile aspirating needle (Fig. 51).



**Method.**—Sterilize the skin over the point of intended puncture; with or without the aid of local anesthesia plunge the point of the tapping needle beneath the surface, but not quite into the cavity which is to be drained. Set fire to a teaspoonful or so of alcohol within the open jar; when nearly burned out fit the cork tightly to the bottle and force the needle into the effusion; after drawing off the fluid remove the needle and close the surface wound with collodion.

### HYPODERMIC INJECTION.

**Employed For.**—(a) Direct medication; (b) local anesthesia (intradermic injection).

**Method.**—Have syringe, needle, and solution sterile. Cleanse the skin surface at the seat of intended operation with soap and water, ether, alcohol, or tincture of iodine. Inject into the summit of a pinched-up fold of the skin (reduces puncture pain) of arm, forearm, thigh (fleshy parts



FIG. 52.—Method of reducing primary puncture pain in cocaineization or hypodermic injection.

favor rapid absorption) (Fig. 52). Avoid superficial veins or deeper vessels.

### VACCINATION, VACCINIA.

(Cow-pox.)

**Definition.**—Inoculation of an individual with the virus of cow-pox.

**Implements.**—Needle, lancet, or ivory point (Fig. 53); fresh virus (bovine or humanized).

**Method.**—(a) Render skin surface aseptic (select by



choice upper and outer third of arm, inner side of thigh); (*b*) abrade the skin until serum exudes; (*c*) carefully work in the moistened virus; (*d*) protect surface of spot until dry. Avoid exposure.

**Time to Vaccinate.**—(1) About the third month; (2)

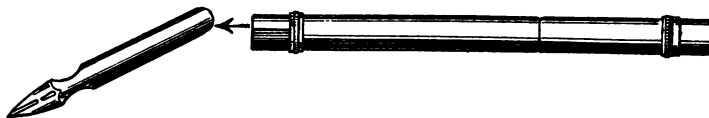


FIG. 53.—Mareschal's individual vaccination stylet.

seventh year; (3) at puberty; (4) repeat whenever small-pox is prevalent.

## COUNTERIRRITATION.

(*Revulsion.*)

**Definition.**—Artificial irritation produced for the purpose of modifying morbid processes in distant parts.

**Action.**—(1) To take blood away from an inflamed part; (2) reflexly through the nervous system.

**Indication.**—(1) For localized inflammation, congestion; (2) neuralgic pain; (3) general depression (shock).

**Produce by.**—1. **Escharotics.**—(*a*) Actual cautery (use in very chronic inflammation, streak applications, to destroy malignant growths); (*b*) caustic potash; (*c*) chromic acid (use for warts, venereal warts); (*d*) corrosive sublimate (phagedenic ulcers); (*e*) solution of mercury (Liquor hydrargyri nitratis) (use in specific or cancerous ulcers); (*f*) bromin; (*g*) silver nitrate (mild and superficial); (*h*) copper sulphate.

2. **Vesicants, Epispastics, Blisters.**—(*a*) Cantharides cerate (apply as a plaster four to six hours; follow with poultice of flaxseed if a blister has not raised); (*b*) a suitable sized metal object heated in boiling water may be used for this purpose; (*c*) strong ammonia-water applied upon a piece of gauze or lint and covered with rubber-tissue or oiled silk.

Drain the blister to secure rapid healing; apply compound resin cerate if it is desirable to continue the irritation. Never use blisters in—(a) diabetes; (b) nephritis; (c) the very young or the very old (as a rule); (d) myelitis—owing to the danger of gangrene.

3. **Rubefacients.**—(Used in wide-spread functional irritations or inflammations). Apply for from ten to thirty minutes. (a) Mustard-plaster: One part ground mustard (black) to five parts of wheat flour or flaxseed; mix with water and apply on muslin or folded newspaper. (b) Turpentine stupe: Wring out a piece of flannel in hot water; dip it into or sprinkle warm turpentine (oil or spirits) upon it; wring out the excess and apply; anoint the skin with vaselin upon removal. (c) Mustard foot-bath: One to two tablespoonfuls (16 to 32 gm.) of ground mustard added to a bucket two-thirds full (10 l.) of water at 110° to 140° F. (43.3°–60° C.); soak the patient's feet and legs for ten to twenty minutes; protect his body from chilling by wrapping in a blanket. (d) Spice plaster or bag: Equal parts of ground ginger, cloves, cinnamon, and allspice, to which add and thoroughly mix one-fourth part of Cayenne pepper, wetting with hot water, alcohol, or whisky. (e) Ammonia-water (apply upon lint for from five to ten minutes; there is danger from sloughing). (f) Tincture of iodine (useful for chronic inflammations of joints and glands). (g) Burgundy pitch (may be left on a part indefinitely without harm). (h) Pitch plaster (Burgundy pitch and wax); warming plaster: Burgundy pitch twelve parts, cantharides cerate one part. An external counterirritant for children consists of equal parts of sweet oil and turpentine (lessen the quantity of turpentine for a milder effect).

#### HEAT AND COLD.

**Action.**—They are identical in effect.

**Use.**—(1) Local: stimulant (if of moderate intensity and applied but for a short time and if followed by immediate reaction); sedative (if of long application, very intense, and if no reaction occurs). (2) Constitutional: (a) Heat may be

used as a pyretic in shock, collapse, insanity; (*b*) cold as an antipyretic in acute fever, sunstroke.

**Application.**—(1) **Heat.**—(*a*) Dry (in the form of hot-water bags or bottles, hot bricks, hot sand or salt bags, heated stovelids, hot-air-oven apparatus (Fig. 54), hot blankets); (*b*) moist poultice (flaxseed, oatmeal, or hops, mixed with water, is sterilized by boiling); hot bath; hot pack; hot douche; hot fomentation (gauze, flannel, or towel wrung out in hot water, hot antiseptic solution; change when cooled). A ready method of producing diaphoresis (sweating) is by pouring water upon hot bricks wrapped up in flannel.

(2) **Cold.**—(*a*) Dry (applied in the form of crushed ice in thin rubber bags, bladders, ice water passed through coils



FIG. 54.—Hot-air oven.

of rubber tubing); cold air (by exposure); moist (irrigation, ice-water compresses, cold pack (wringing sheet out in ice water and wrapping it around the patient. Keep it wet by sprinkling); tepid bath (gradually reduced); sponge-bath (keep the patient's body-surface moist, fanning him all the time); alternating douche of hot and of cold water.

#### LINIMENTS.

These are local stimulants useful in mild neuralgic or rheumatic pains: (*a*) Ammonia; (*b*) chloroform; (*c*) camphor; (*d*) turpentine. Apply upon a cloth or by rubbing

into the parts for a period of from five to twenty minutes; anoint with vaselin after each application to prevent abrasion.

#### OINTMENTS.

Mildly stimulating and emollient: (*a*) Mercurial (blue ointment); (*b*) ichthyol; (*c*) belladonna; (*d*) boric acid; (*e*) resorcin; (*f*) iodin. Do not use iodin locally where there will be a possibility of a future cutting operation, because the skin becomes like leather and heals badly.

**Application.**—Apply upon gauze or lint, nicked to allow for the escape of discharge if present.

#### CUPPING.

1. *Dry Cups.*—No blood is lost (Fig. 55). Cupping-glasses or wineglasses. Exhaust the air by burning a little

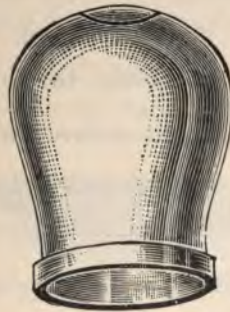


FIG. 55.—Dry cup.

roll of paper, piece of lint, or paper dipped in alcohol and lighted. Before the flame is extinguished rapidly invert the glass upon the skin surface.

2. *Wet Cups.*—(*a*) Prepare the skin by cleansing with soap and water, dry thoroughly, and apply dry cups; (*b*) scarify with a bistoury or by means of a spring scarificator upon the cupped sites; (*c*) reapply the cups to the incised areas; (*d*) treat the scarification wounds antiseptically.



**Use.**—Local depletion; wet cups are better in serous inflammations.

#### LEECHING.

(a) American leech (draws about a teaspoonful (4 c.c.) of blood).

(b) Swedish leech (draws three or four (12–16 c.c.) teaspoonfuls).

A mechanical leech consists of a scarifier, cup, and exhausting air-pump attachment.

**Method.**—Prepare the skin surface by cleansing with soap and water; dry thoroughly; apply the leech to the area moistened with blood or milk; confine the leech to the moistened area by means of an inverted glass tumbler. To remove the leech sprinkle it with salt. Dress the wound antiseptically; apply a compress, nitrate of silver, torsion (acupressure), for continuous bleeding.

**Use.**—Local depletion.

#### SCARIFICATION.

Small linear incisions through the skin and subcutaneous or mucous tissues.

**Use.**—Local depletion, to relieve tension.

#### PUNCTURATION.

Punctures with a sharp-pointed bistoury through the skin or mucous tissues.

**Use.**—Local depletion, to relieve pressure.

#### DEEP INCISION.

Deep puncture and incision with a sharp-pointed bistoury.

**Uses.**—(a) To relieve tension; (b) to secure drainage.

#### PLASTERS.

(a) Belladonna (use as a local sedative in neuralgia, mastitis, adenitis; remove if dryness of throat or disordered vision occurs—the first symptoms of belladonna-poisoning); (b) mercury (used for its resolvent effect upon indurated glands, chronic arthritis); (c) adhesive, “American surgeon’s

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adhesive plaster" (contains rubber, and adheres without heating); (*d*) resin plaster (requires heating to adhere).

### COLLODION.

Collodion and cotton. Use to support and seal external flaps and wounds.

### MASSAGE.

**Definition.**—Manual manipulations of a part for the purpose of stimulation. May be applied twice daily, once daily, or every other day; each application may last from twenty minutes to one hour.

**Consists of.**—(1) Rubbing (stroking movements, gentle at first, afterward of increasing firmness); (2) kneading (rolling, circular, pinching movements); (3) tapping (percussion over the surface with the leveled finger-tips produced by flexion, ulnar side of the hand, or by the use of a mechanical muscle-beater); (4) passive motion (elevation, flexion, and contraction of the parts produced by the operator).

### ELECTRICITY.

**Uses.**—(*a*) As a muscle tonic; (*b*) for nerve-sedative action (employ that form of electricity which gives the best



FIG. 56.—Electric brush.

contractions with the least amount of pain and discomfort to the patient) for implements required see Figs. 56, 57;

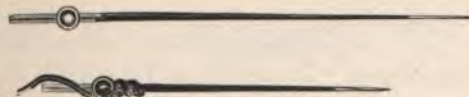


FIG. 57.—Electrolysis needles.

(*c*) electrolysis (used in the treatment of aneurysm, tumors, for the removal of superfluous hair); (*d*) cautery, *ecraseur*

(is followed by least hemorrhage when used at a dull red heat).

## X-RAY.

(Röntgen Ray.)

**Apparatus.**—(a) Storage battery or motor and transformer; (b) current interrupter; (c) induction coil (Ruhmkorff); (d) Crookes' tube; (e) fluoroscope (screen of calcium tungstate); (f) sheet lead (for the protection of skin surface of patients).



FIG. 58.—Piffard's hand arc and ultra-violet ray lamp.

**Uses.**—(a) Diagnosis (foreign bodies, gall- or kidney-stones, aneurysm, fracture, dislocation, osteomyelitis); (b) as a curative measure (eczema, lupus, surface malignant growths—epithelioma).

**Exposure** varies from three to thirty minutes. Dangers from too long or too frequent application: loss of hair, nails, skin (tanning), burns of skin and deeper parts (partake of the nature of chronic trophic neuritis).

**Finsen Ray (Ultra-violet).**—Apparatus consists of—(a) Source of light (sun, arc light); (b) spectral separator; (c) condensor (reflecting and focusing) (Fig. 58).

**Use.**—Curative in eczema, lupus.

## RADIUM.

Antiseptic properties through the radioactivity of this new element (derived from pitchblende) upon normal salt solution have been discovered. Its action is to inhibit disease progress in tissues, and has been found useful, if not curative, in the treatment of lupus, rodent ulcer, and cancer (epithelioma). Reaction upon atrophied optic nerves in cases of total blindness have been noted.



## CLINICAL THERMOMETER.

May be of Fahrenheit (common form) or Centigrade scale. To reduce readings—(1) Fahrenheit to Centigrade: Subtract 32 from the number of Fahrenheit degrees and multiply the remainder by  $\frac{5}{9}$ ; (2) Centigrade to Fahrenheit: Multiply the number of Centigrade degrees by  $\frac{9}{5}$  and add 32.

Thermometers may be—(a) straight, self-registering ( $90^{\circ}$  to  $110^{\circ}$  F.— $33.3^{\circ}$  to  $44.4^{\circ}$  C.); (b) surface, coiled or bulb ( $80^{\circ}$  to  $110^{\circ}$  F.— $26.6^{\circ}$  to  $44.4^{\circ}$  C.).

Temperature may be taken in—(a) Mouth; (b) axilla; (c) rectum; (d) vagina. Most exact in vagina and rectum. Mouth-temperature is higher than that of the axilla and less than that of the rectum. Axilla-temperature is somewhat less than a degree below the rectal.

## POISONS AND ANTIDOTES.

*Acids, Mineral.*—Give chalk, flour, white of egg, magnesia (plaster torn off the wall may be used in an emergency); a solution of carbonate of soda; emollient drinks; fixed oils (sweet oil, olive oil, cod-liver oil). Give plenty of water to dilute the acid.

*Acid, Carbolic.*—Any soluble sulphate (magnesia), alcohol acts as a direct antidote if given during the first ten or fifteen minutes; whisky may be employed for the purpose.

*Acid, Hydrocyanic.*—Secure plenty of fresh air; carry on artificial respiration; apply cold affusion; ammonia—inhalation and intravenously in a vein of the leg.

*Aconite.*—Give emetics; stimulants (external and internal); keep up the body-heat; patient is to be placed flat on his back.

*Antimony Tartrate.*—Give vegetable acids—tannic acid, gr. v–xv (0.333–1 gm.), catechu, fʒj–ij (4–8 c.c.).

*Arsenic.*—Give freshly precipitated hydrated sesquioxide of iron (made by adding magnesia to any iron solution).

*Atropin* (gr.  $\frac{1}{100}$ —0.0006 gm.), *Belladonna* (gr.  $\frac{1}{8}$ — $\frac{1}{4}$ —0.008–0.016 gm.), *Stramonium* (gr.  $\frac{1}{8}$ — $\frac{1}{4}$ —0.008–0.016 gm.).—Emetics (mustard flour in water); apply cold to the head;



give physostigma (gr.  $\frac{1}{10}$ — $\frac{1}{8}$ —0.006–0.013 gm.), or pilocarpin (gr.  $\frac{1}{8}$ —0.008 gm.).

*Cantharides*.—Give emetics; emollient drinks; opium (gr.  $\frac{1}{4}$ — $\frac{1}{2}$ —0.016–0.033 gm.) by mouth and rectum; large draughts of water to flush the kidneys.

*Chlorin-water*.—Give albumin (white of egg, milk, flour).

*Chloroform*.—Secure plenty of fresh air, carry on artificial respiration (inclining head down, pull the patient's tongue forward); brandy and ammonia intravenously in leg; hypodermic injection (15 min.—1 c.c.) tincture of digitalis; gr.  $\frac{1}{60}$  (0.001 gm.) of atropin.

*Colchicum*.—Give emetics, followed by demulcent drinks; keep up external heat. If coma is present, brandy, ammonia, coffee. Opium in large dose.

*Conium*.—Give emetics; stimulants (external and internal).

*Copper Sulphate*.—Give yellow prussiate of potash (may be given freely if pure); soap.

*Corrosive Sublimate*.—Give albumin (white of egg—four gr. (0.266 gm.) of sublimate requires the white of one egg); flour; milk; equal parts of lime-water and milk; emetics or stomach-pump.

*Croton Oil*.—Give emetics; wash out the stomach; mucilaginous fluids containing opium.

*Digitalis*.—Give emetics; recumbent position; tincture of aconite (1–5 drops—0.066–0.333 c.c.); opium (gr.  $\frac{1}{4}$ — $\frac{1}{2}$ —0.16–0.033 gm.).

*Elaterium*.—Give demulcent drinks; enemata of opium; external heat.

*Hyoscyamus*.—Stomach-pump; give emetics; stimulants (external and internal); physostigma (gr.  $\frac{1}{10}$ —0.006 gm.); pilocarpin (gr.  $\frac{1}{8}$ —0.008 gm.).

*Illuminating Gas*.—Hypodermic injections (1 min.—0.066 c.c.) of nitroglycerin; carry on artificial respiration.

*Iodin*.—Give emetics; demulcent drinks (starch or flour in water); opium (gr.  $\frac{1}{4}$ — $\frac{1}{2}$ —0.016–0.033 gm.); external heat.

*Lead Salts*.—Give any soluble sulphate (magnesia or soda). Follow with emetics, opium (gr.  $\frac{1}{4}$ — $\frac{1}{2}$ —0.016–0.033 gm.), and milk.

*Lobelia*.—External and internal stimulation.

*Morphin; Opium.*—Atropin (gr.  $\frac{1}{100}$ —0.006 gm.) hypodermically until respirations number eight a minute; stomach-pump; stimulants (external and internal); brandy; strong coffee; cold affusion; ammonia to nostrils; galvanic shocks; compelling patient to move about; artificial respiration; permanganate of potassium; cocain (gr.  $\frac{1}{4}$ — $\frac{1}{2}$ —0.016—0.033 gm.; repeat if necessary).

*Oxalic Acid.*—Give lime (plaster, lime-water, milk of lime).

*Phosphorus.*—Sulphate of copper in emetic dose as a chemic antidote; emetics; purgatives. No oils.

*Potash and Soda Salts.*—Dilute acetic acid; citric acid; lemon-juice; vinegar; fixed oils: demulcent drinks.

*Silver Nitrate.*—Solution of common salt; demulcent drinks; emetics.

*Strychnin; Nux Vomica.*—Give 30 grains (2 gm.) of chloral and 60 grains (4 gm.) of bromid of potassium; nitrate of amyl.

*Tobacco.*—Emetics; stimulants (external and internal); strychnin (gr.  $\frac{1}{30}$ — $\frac{1}{15}$ —0.0022—0.0044 gm.).

*Zinc Salts.*—Carbonate of soda; emetics; warm demulcent drinks.

*Poisonous Fish.*—Emetics to wash out the stomach; purgatives; stimulants.

## CHAPTER III.

### PREPARATION.

#### PATIENTS.

**General.**—Rest in bed twenty-four hours; restricted diet (milk, buttermilk, soup, eggs, rare beef, toast, tea, coffee, water); no food upon the morning of operation; night before, full bath, secure catharsis.

R. Ol. ricin . . . . . ℥ $\overline{5}$ i (32 c.c.).  
Glycerin . . . . . ℥ $\overline{5}$ i (32 c.c.).  
Ol. gaultheriæ . . . . . gtt. iv (0.266 c.c.).

M. Sig.—One dose, to secure a free movement of the bowels.

**Clothing.**—Attire in that to be worn subsequently (have extra garment if there is danger of soiling).

**Local.**—Day before: (1) Shave the parts (a depilatory powder such as the following may be sometimes used to advantage):

R. Crystallized sulphid of sodium . . . . . ℥iij (12 gm.).  
Unslaked lime . . . . . ℥x (40 gm.).  
Starch . . . . . ℥xj (44 gm.).

M. Pulverize.

Sig.—Mix up a portion of the powder into a paste by adding a little water. Apply to the hairy surface. In five to ten minutes the hair may be washed off.

(2) Scrub with hot water and soap; (3) scrub with ether and alcohol, turpentine (spirits), or benzin; (4) scrub with bichlorid solution (1 : 500 to 1 : 2000, depending upon the sensitiveness of the skin surface); (5) apply soap poultice, carbolic solution (1 : 500), or a wet bichlorid dressing. At the time of operation: (1) Repeat the scrubbing with hot water and soap for five to ten minutes, accompanied by a free flushing

with sterile water; (2) scrub with ether, alcohol, chlorin-water, turpentine (spirits); (3) bichlorid solution (1 : 500 to 1 : 2000), carbolic solution (1 : 500); (4) flushing with sterile-water.

**Special.**—*Head.*—Shave entire scalp.

*Axilla, pubes, breast, navel, genitals, and perineum* all require special care when seat of operation is near.

*Vagina.*—(1) Shave pubes; (2) scrub (fifteen minutes) with small brush (tooth), hot water, and soap; vagina and cervix with fingers and mop of gauze; rinse with four quarts hot, sterile water; (3) irrigation (2 quarts) hot permanganate solution (1 : 2000), boric acid (1 : 500), creolin (1 : 500), bichlorid of mercury (1 : 5000), hydrogen dioxid (1 : 100), sodium carbonate (1 : 500); (4) hot, sterile water. Pack to cervix with bichlorid or salicylic gauze, allowing it to remain until the time of operation; repeat scrubbing (five to ten minutes) and irrigation at time of operation.

*Rectum.*—Scrub, shave parts, irrigation, hot soap solution, boric acid (1 : 500), hot sterile water; gauze pack (salicylic, iodoform, plain sterile); repeat the irrigation at time of operation.

*Mouth.*—Clean the teeth with a brush (orris root and precipitated chalk, equal parts), rinse the mouth with warm water and soap, warm boric acid (1 : 500), soda (1 : 500), hydrogen dioxid (1 : 100) or sterile water (saliva has great antiseptic properties).

*Throat and Nose.*—Douche, hot soda solution (1 : 500), hydrogen dioxid (1 : 100), boric acid (1 : 500); spray (Dobell's solution, hot sterile water); pack the nasal cavity with moist salicylic or sterile gauze.

*Ear.*—Douche with hot soda solution (1 : 500), boric acid (1 : 500), hot sterile water.

*Emergency Operation or Wounds.*—Scrub the area surrounding the parts, if a wound, with hot water and Castile or green soap; remove grease by rubbing with sweet oil, benzin; follow with turpentine (spirits), alcohol, ether; rinse with hot sterile water, bichlorid (1 : 3000 to 1 : 1000); hot sterile water or hydrogen dioxid (1 : 10) alone may be employed.



## SURGEON, ASSISTANT, NURSE.

Asepsis and antiseptics being relative in value, success depends upon attention to detail.

**Sources of Operative Wound Infection.**—Surrounding epithelial surface, should be treated by methods of cleansing already given. Operate through antiseptic rubber adhesive spread over site of intended operation (Fig. 59).

**Surgeon's and Assistant's Hands, Hair of Head and Face, and Scalp.**—**Hands.**—(a) (1) Scrub hands and arms to above elbows with hot water and soap (green soap solution is made by adding hot water and stirring into a thick syrup; tincture may be formed by dissolving in alcohol) for



FIG. 59.—Sterile adhesive dam.

five to ten minutes; (2) clean nails after clipping and filing well rounded and nearly flush with finger-ends. Bacteria, which are constantly present beneath the nails, not so likely to be set free during manipulations of fingers when they are of this length; (3) rub hands, fingers, and nails with a handful of sodium carbonate (washing-soda) and chlorid of lime (bleaching powder); rinsing in hot sterile water; (4) scrub with hot bichlorid (1 : 1000); (5) dip hands and arms at intervals in bichlorid (1 : 1000).

(b) (1) Regular preliminary scrubbing with soap and water (running always best); (2) dip hands and arms in absolute alcohol; scrub for one minute; (3) scrub hands, arms, fingers, and nails with hot sublimate solution (1 : 1000); (4) repeat

scrubbing in bichlorid of mercury (sublimite) (1 : 1000) after touching anything not sterile.

(c) (1) Preliminary scrubbing with soap and water; (2) dip hands and arms in saturated solution of potassium permanganate; (3) decolorize in a saturated solution of oxalic acid; (4) remove excess of acid solution by scrubbing with sterile water; salt solution; bichlorid (1 : 500) dip. Operation may be performed while arms and hands contain the permanganate, removal being accomplished by the oxalic solution afterward. Prevent skin irritation after use of this method by washing in lime-water (saturated solution). Avoid infection by wearing gloves (thread, rubber) when dressing infected wounds.

**Hair of the Head and Face, Scalp, Body.**—Treat by frequent bathing; face should be smoothly shaven, hair of head short; wear sterile cap or towel; take care not to touch the heads of assistants during work, thus dislodging dandruff; special sterilized suit of linen or duck for each operation; canvas shoes. Improvise an operating gown from sterile towels, folded sheet tied under the operator's arms.

**Breath, Atmosphere.**—Avoid coughing or talking across wound; avoid dust-bearing air-currents. Operator's hands alone should come in direct contact with wound surfaces (employ instruments). Visitors should wear gowns (linen and calico do not carry microbes to the same extent as woollen garments).

#### INSTRUMENTS, DRESSINGS, PADS, SPONGES, SUTURES, LIGATURES.

**Care of Instruments.**—Boil five to fifteen minutes in 1 per cent. soda solution; drain, place on sterile towel for use; tray containing carbolic solution (1 : 20).

**Dressings, Pads, Bandages, Towels, Sheets, Gowns.**—After laundering, sterilize with moist heat (streaming or compressed steam). Treat cotton-batting by boiling in soda solution (removes the oil and renders the cotton absorbent); dry by baking. Sterilize absorbent cotton by baking.

**Sponges, Gauze.**—Best and most commonly used made

by folding cut edges in making squares two by four inches in size and six or eight layers in thickness. **Marine sponges** are very difficult to sterilize after once using. Remove grit by beating in bags, soak out fiber and lime salts in hydrochloric-acid solution (5 per cent.) four days; wash thoroughly in running water (prevent softening); wash in soap lather, rinse, place until used in bichlorid (1 : 1000), carbolic (1 : 20). After once using wash in carbonate of soda (1-2 oz.—32-64 gm. to quart of water), rinse, place in bichlorid (1 : 1000) until needed.

**Bichlorid Gauze.**—Washed (boil the gauze in a solution of sodium carbonate to remove the grease), sterilized, and dried cheese-cloth, cut in 12-yard lengths (weighing 13 ounces) and folded, is to be used. Soaked in the solutions for twenty-four hours and then dried in a sterilizer, the gauze will be impregnated with the mercuric chlorid.

1. To make 1 : 1000 strength gauze :

R. Absorbent gauze . . . . .  $\frac{5}{8}$ xij (12 yds.).  
 Bichlorid sol. (1 : 1000) . . . . .  $\frac{1}{2}$ xijss.  
 Sterile water . . . . . q. s. ad  $\frac{5}{8}$ xxxij.

Sig.—Stir and allow the gauze to be immersed for twenty-four hours. Dry in a sterilizer.

2. To make a 1 : 1500 strength gauze :

R. Prepared gauze . . . . .  $\frac{5}{8}$ xij (12 yds.).  
 Bichlorid sol. (1 : 1000) . . . . .  $\frac{1}{2}$ xxv.  
 Sterile water . . . . . q. s. ad  $\frac{5}{8}$ xxxij.

Sig.—Stir, soak for twenty-four hours, and dry.

3. A ready formula to make a 1 : 500 strength gauze :

R. Corrosive sublimate . . . . . 1 part.  
 Sodium chlorid . . . . . 2 parts.  
 Water . . . . . 500 "

M. Sig.—Immerse the measured quantity of sterilized gauze in the solution for twenty-four hours. Drain off the excess and keep in a dry or moist condition in closed jars.

**Thiersch's Gauze :**

R. Salicylic acid . . . . . 1 part.  
 Boric acid . . . . . 8 parts.  
 M. Sig.—Thiersch powder.

Prepare a 1 : 500 solution of Thiersch's powder (292 grains of powder to 1 quart of water). Saturate and immerse for twenty-four hours prepared cheese-cloth (13 oz. or 12-yard lengths); wring out the excess of fluid.



**Iodoform Gauze.**—To make a 10 per cent. iodoform gauze:

R. Prepared (washed sterilized gauze) . . .	475 gr.
Iodoform . . . . .	116 gr.
Glycerin . . . . .	$\frac{1}{3}$ j.
Alcohol . . . . .	$\frac{1}{3}$ ij.

M. Drain the gauze, wrap in sterile paraffin paper, lastly in sterilized oiled muslin. Place in tightly corked jars. To prepare a 20 per cent. gauze employ 260 grains of weighed iodoform; prepare 40 per cent. gauze by using 700 grains of the drug in the formula given above.

**Permanganate Gauze.**—To make a 1:1000 strength gauze:

R. Absorbent gauze . . . . .	$\frac{3}{5}$ xij (12 yds.).
Permanganate pot. sol. . . . .	$\frac{1}{3}$ xijss.
Sterile water . . . . .	q. s. ad $\frac{1}{5}$ xxxij.

M. Sig.—Immerse the gauze for twenty-four hours; drain off the excess. Keep moist in closed jars.

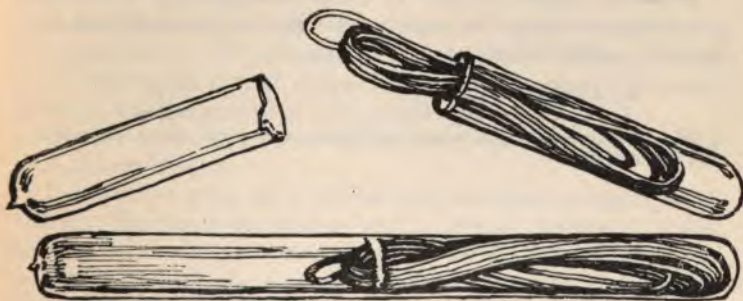


FIG. 60.—Sterile catgut in glass tubes ready for use.

**Sutures and Ligatures.**—Silk, horsehair, and silver wire may be treated by boiling for thirty minutes; keep in stoppered bottles, dry, in carbolic solution (1:20), absolute alcohol. **Silkworm-gut** is to be kept dry or preserved in absolute alcohol; carbolic-acid solution (1:20) thirty minutes before using. Carbolic-acid solutions are employed because needles will not be acted upon as in the case of bichlorid. **Catgut** (plain): (a) Boil in alcohol (requires special apparatus); (b) oil of juniper berries for one week, then in absolute alcohol (prevents brittleness) until used. *Chromicized*,



wash in absolute alcohol, then place in following for from forty-eight to seventy-two hours :

R. Chromic acid . . . . . gr. v (0.333 gm.).  
 Carbolic acid . . . . . ℥ij (8 c.c.).  
 Alcohol . . . . . ℥ssij (4 c.c.).  
 Aqua . . . . . 384 c.c.

M. Wash in alcohol, place until used in covered jars filled with alcohol; place in carbolic acid (1 : 20) twenty minutes before using.

**Kangaroo and animal tendon** is specially prepared, as is also catgut, in tubes ready for use (Fig. 60).

**Iodized Catgut.**—Ordinary catgut placed for eight days in following solution :

R. Iodin . . . . . 1 part.  
 Potassium iodin . . . . . 1 "  
 Water . . . . . 100 parts.

M. Tensile strength not affected up to six months.

**Bichlorid Catgut.**—(Said to keep indefinitely.) Place the gut strings in ether for twenty-four hours (dissolves out fat), then in a solution of :

R. Bichlorid of mercury . . . . . 1 part.  
 Alcohol (95 per cent.) . . . . . 500 parts.

M. Ordinary-sized gut strings are sterile after eight days ; large sizes, after fourteen days.

## CHAPTER IV.

### ANESTHESIA.

**Action.**—Is produced by direct action upon the cerebro-spinal nerve-centers.

**Indication.**—To relieve pain of operative work and childbirth; to overcome general spasm of strychnin-poisoning, traumatic tetanus, puerperal, hysteric, and uremic convulsions; to overcome muscle spasm in fracture and dislocation; to relieve pain and secure relaxation during passage of gall- or kidney-stones.

**Selection.**—Use *ether* by choice when administrator is inexperienced; in atheroma and organic heart disease. Loud murmurs denote power of muscle, therefore safer than when low, showing poor compensation.

Use *chloroform* in brain and eye work; in presence of lung and kidney disease.

Use *nitrous oxid* as a preliminary to other general anesthetics; for short operations and to regain motion in ankylosed joints. It is contraindicated in atheroma or aneurysm.

*Bromid of Ethyl.*—Prompt in action, pleasant, like chloroform, but safer (does not depress the heart); sometimes anesthesia is produced without unconsciousness. It is useful in short operations.

*A. C. E. mixture* is composed of alcohol 1 part, chloroform 2 parts, ether 3 parts. This anesthetic is to be given and acts like chloroform, but its use is objected to for the reason that the amount of chloroform inhaled cannot be positively determined.

*Chlorid of ethyl* is a rapidly acting anesthetic which may be used for short operations and examinations. A closed mask is necessary for administration. Its action is similar to that of chloroform.

**Administration.**—No two individuals ever take an anesthetic exactly alike, and the skilful administrator is one who has recognized this and is simply careful. Ether may be more safely used than chloroform, yet both are deadly. The anesthesia is oftentimes more important than the operation, and at all times the operator should keep the anesthetist informed of the progress of the surgical work. The latter, bearing in mind that he could kill any patient with his inhaler, should seek to adjust the depth of anesthesia to the operation so wisely as to imitate sleep, and not death, in his patient.

**Method.—General.**—Have the patient's bowels thoroughly flushed during the previous twenty-four hours—calomel gr.  $\frac{1}{4}$  (0.016 gm.) every thirty minutes until 2 grains (0.13 gm.) have been given; follow with Epsom salts, 1 oz.

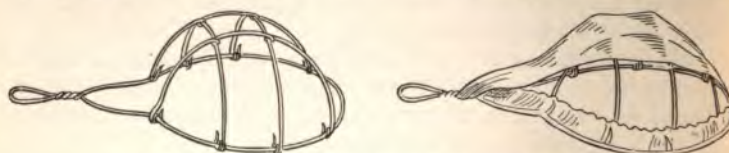


FIG. 61.—The author's modification of Esmarch's inhaler.

(32 gm.) in divided dose, or castor oil  $\frac{1}{2}$  to 2 fl. oz. (16–64 c.c.). Hot soapsud enema upon the morning of operation if needed. Empty the bladder. No food to be given for six hours before the operation. Examine the heart, lungs, and urine. Remove all superfluous garments, and attire in clothes to be worn subsequently. Carefully conserve body-heat by blanketing, avoiding at all times unnecessary skin exposure. Remove anything loose from the mouth, taking note of dental work. Patient recumbent, head level or a little below that of the body, turned away from the direction of the operator. If a woman, remove hairpins, plait the hair, having it well wrapped up in a towel (this lessens post-operative nausea). Protect the patient's eyes with a towel and the skin of the mouth, nose, and cheeks with vaselin. Instruct patient to listen calmly for your voice at all times, and to keep his hands tightly clasped—the tighter the

better, and the quicker will sleep be produced (mind control). Allow no other voices or noises.

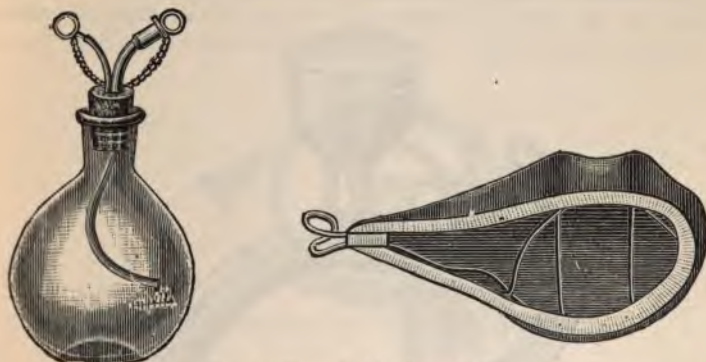


FIG. 62.—Esmarch chloroform-inhaler.

*Implements.*—Inhalers (Figs. 61–64)—improvise a chloroform inhaler (handkerchief); ether (towel and folded cardboard, with gauze or sponge); wooden or hard rubber oral

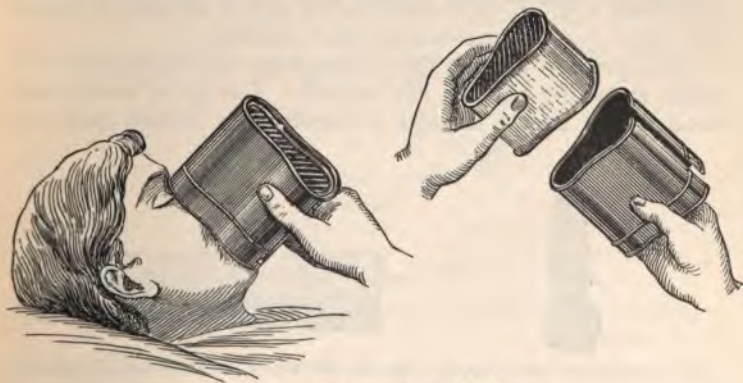


FIG. 63.—Allis's aseptic ether-inhaler.

screw (Fig. 65) or mouth-wedge (Fig. 66); gag; tongue forceps; curved needle threaded with silk thread for tongue



suture; swabs fastened to sticks or forceps (3); sterile hypodermic syringe and needle.

*Drugs.*—Tincture of iodine (renders site of puncture sterile);



FIG. 64.—Author's combined inhaler for gas and liquid anesthetics.

strychnin (gr.  $\frac{1}{30}$ — $\frac{1}{12}$ —0.002—0.005 gm.); atropin sulphate (gr.  $\frac{1}{150}$ — $\frac{1}{100}$ —0.0004—0.0006 gm.); whisky.

*Emergency.*—Loosen the clothes from about the waist and neck, removing corsets if a woman. Lavage if undigested food rises. Empty bladder (catheter) and rectum (enema).



FIG. 65.—Hard rubber oral screw.



FIG. 66.—Wooden mouth-wedge and gag (original).

Examine heart, lungs, urine. Watch in all cases patient's face, respiratory movement, and pulse (radial preferable), though a single-eared stethoscope (Fig. 67) attached over



the precordial region gives constant information while allowing the hand to be free *continuously throughout the operation*. Note ciliary and pupillary reflexes from time to time. By constant care study to give the patient all the air and the least amount of anesthetic possible. Ether may be admin-



FIG. 67.—Author's single-eared anesthetizing stethoscope.

istered by dropping upon a chloroform mask (drop method of ether anesthesia), not so disturbing to the patient.

*Caution.*—Never anesthetize a female unattended (psychic erotism).

Ether is inflammable, chloroform is not; in night work have light above (ether vapor being heavier than air, always



FIG. 68.—Method of pushing the lower jaw forward to prevent obstruction to breathing.

falls). Secure ventilation when using chloroform (injurious chemic decomposition from heat). Electric light is the best artificial illuminant, but even this has caused ether ignition.

*Complications.*—*Mucus Collection* (not necessarily due to poor administration).—Treatment: Head to one side, low-

ered, mouth opened, swab throat. If breathing becomes interrupted, stop anesthetic, allow patient to come out sufficiently for irritation to cause expulsion.

*Clamping of Jaws.*—Treatment (early): Head to one side, increase anesthesia. Later, force opening by screw or gag (having care for dental work) or leverage forward by means of thumbs placed against the patient's chin and braced with fingers from the angles of the jaw, or by the method shown in Fig. 68.

*Spasm of diaphragm* denotes onset of vomiting or release from anesthesia. Treat by pushing the anesthetic, or if patient's condition will not permit, allow vomiting seizure to be completed, when deep anesthesia may be carefully renewed.

*Vomiting.*—Treatment: Early stage of anesthesia in a patient otherwise doing well, push the anesthetic; later stage, or if patient becomes livid, stop the anesthetic, turn the patient's head to one side, draw the tongue forward, clear the mouth and throat, and allow recovery from the paroxysm. When using ether with a bag-inhaler, the addition of fresh strong ether often excites vomiting. Counteract this tendency by commencing with sufficient ether (2–3 fl. oz.—64–96 c.c.) in the bag to carry the patient well into the anesthesia. Sometimes no further addition will be necessary during the entire operation if care is taken to prevent evaporation from the inhaler when not in use (turn it face down upon a folded towel). More ether will be required in summer-time (due to heat evaporation). Respirations are sometimes entirely suspended. If in early stage, push the anesthetic to get a regular action before consciousness is lost (direct the patient to breathe). Later, suspension of respiration is a danger signal; stop the anesthetic.

*Poisoning* may occur from idiosyncrasy (rare) or overdose. It is marked by lividity or pallor of face, stertorous breathing, sudden or progressive dilatation of the pupil, complete loss of reflex, failing pulse (best seen in expression and color of face), thready and marked irregularity of pulse, failing or irregularity in respiration, darkening of blood at site of operation, fall of temperature, loss of body tone.

Treatment—*Ether*: Stop the anesthetic; head to one side, draw the tongue forward, employ artificial respiration (Syl-

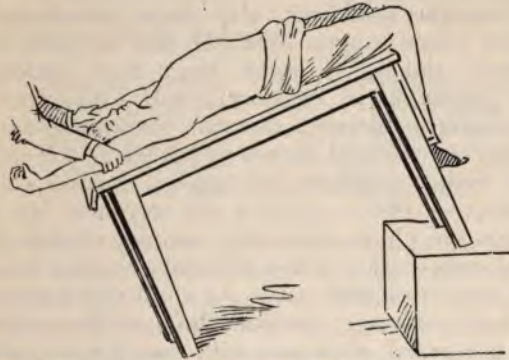


FIG. 69.—Sylvester's method of performing artificial respiration (inspiration).

vester method—Figs. 69, 70; Laborde's method: Draw out the tongue forcibly 12 to 16 times a minute); forced artificial

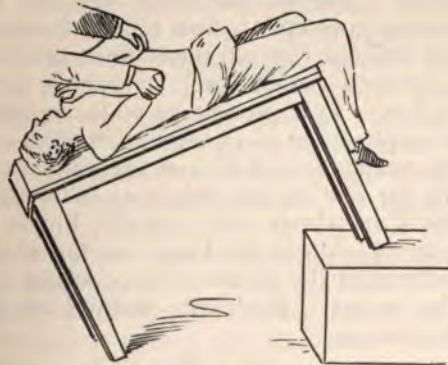


FIG. 70.—Sylvester's method of performing artificial respiration (expiration).

respiration; maintain body-heat; atropin sulphate (gr.  $\frac{1}{150}$ — $\frac{1}{100}$ —0.0004—0.0006 gm.); strychnin (gr.  $\frac{1}{30}$ — $\frac{1}{12}$ —0.002—

0.005 gm). Do not cease artificial respiration until certain that life is extinct (success has followed in a number of cases after three or four hours continuous effort). *Chloroform*: Stop the anesthetic, slap chest with a wet towel, head down (draw tongue forward), feet up (acts mechanically, blood sinking to right heart from abdomen and probably causes it to contract); rub with ether; apply mustard; electric battery; maintain respiration (protracted period) and use artificial means which forces the chloroform from the lungs; ammonia inhalation; tincture of digitalis (10–20 drops—0.666–1.333 c.c.) and strychnin (gr.  $\frac{1}{30}$ – $\frac{1}{12}$ —0.002–0.005 gm.) hypodermically; employ forcible rhythmic precordial compression (120 a minute); oxygen inhalations; nitrite of amyl is of little use. As a last resort interthoracic manual heart massage (incision three or four inches long through precordial interspace with resection of costal cartilage if necessary. Grasp the heart, and institute rapid, rhythmic compression manipulations. If required during abdominal operations, the heart may be grasped through the diaphragm). If morphin has been used before general anesthesia, there will be the additional depressant action of this drug to combat. *Nitrous-oxid Gas*: Stop the anesthetic; force the patient's jaws open; draw tongue forward; elevate patient's feet; artificial (forced) respiration; atropin sulphate (gr.  $\frac{1}{30}$ – $\frac{1}{100}$ —0.0004–0.0006 gm.); strychnin (gr.  $\frac{1}{30}$ – $\frac{1}{12}$ —0.002–0.005 gm.) Low percentage of hemoglobin contra-indicates the employment of general anesthetics.

**Local.**—By means of cold, ice, or ice and salt in contact with the part for one or two minutes; ether or rhigolene spray (produces anesthesia very quickly, but is highly inflammable); ethyl chlorid produces anesthesia by freezing the part); infiltration (by means of hypodermic syringe and needle of the tissues. Schleich's method employs three strengths of solutions:

- (A) R. Cocain hydrochlorate . . . . . gr. iij (0.199 gm.).  
 Morphin hydrochlorate . . . . . gr.  $\frac{3}{4}$  (0.026 gm.).  
 Sodium chlorid . . . . . gr. iij (0.199 gm.).  
 Distilled sterile water . . . . . ℥iij, ℥iij, ℥xij (108.8 c.c.).  
 Phenol (5-per cent.) . . . . . gtts. ij (0.133 c.c.).

**M.** May be used when inflamed areas are to be anesthetized.



- (B) **R.** Cocain hydrochlorate . . . . . gr. iss (0.099 gm.).  
 Morphin hydrochlorate . . . . . gr.  $\frac{3}{8}$  (0.026 gm.).  
 Sodium chlorid . . . . . gr. iij (0.199 gm.).  
 Distilled sterile water . . . . . f $\frac{3}{4}$ iij, f $\frac{3}{4}$ iij, ℥xij (108.8 c.c.).  
 Phenol (5 per cent.) . . . . . gtts. ij (0.133 c.c.).  
**M.** Medium solution for general use.

- (C) **R.** Cocain hydrochlorate . . . . . gr.  $\frac{1}{4}$  (nearly) (0.011 gm.).  
 Morphin hydrochlorate . . . . . gr.  $\frac{3}{8}$  (0.026 gm.).  
 Sodium chlorid . . . . . gr. iij (0.199 gm.).  
 Distilled sterile water . . . . . f $\frac{3}{4}$ iij, f $\frac{3}{4}$ iij, ℥xij (108.8 c.c.).  
 Phenol (5 per cent.) . . . . . gtts. ij (0.133 c.c.).  
**M.** Weak solution when large areas are to be infiltrated.

Using soda (1 per cent.) solution, salt (1 per cent.) solution, plain water, lessens sensibility by pressure; cocain hydrochlorate ( $\frac{1}{2}$  to  $\frac{1}{10}$  per cent.) dissolved in warm weak soda solution, injected interdermically in a broad line (for incision and subsequent sutures), secures loss of sensation up to one hour and a half; inject nerve-trunks as met; antidote for overdose, morphin sulphate (gr.  $\frac{1}{4}$ — $\frac{1}{2}$ —0.016—0.033 gm.) hypodermically, repeated as needed. Do not inject more than the equivalent of  $\frac{1}{3}$  grain (0.022 gm.) of cocain hydrochlorate or apply more than  $\frac{2}{3}$  grain (0.044 gm.) to mucous surface. Eucain hydrochlorate is not so poisonous as cocain, and may be used in strength of from 2 to 5 per cent. It may be sterilized by boiling. Mucous membrane (nose 1 or 2 per cent. upon cotton pledget five to twenty minutes to secure anesthesia); urethra, use 1 or 2 drams (4—8 c.c.) of a 1 or 2 per cent. solution.

**Spinal Cocainization.**—May be employed after careful consideration in cases where general anesthesia is contraindicated.

**Implements.**—Two sterile glass syringes fitted with fine extra long needles.

**Method.**—Prepare the skin surface about the fourth lumbar vertebra (a line joining the iliac crests crosses the spinous process of the fourth lumbar vertebra) by a careful sterilization. Place the patient upon his side, with the shoulders elevated and arching the back (increases the vertebral interspaces). Enter the needle between the second and third lumbar vertebræ in the middle line, plunging it



onward until cerebrospinal fluid escapes; inject 1 cm. of a 1 : 2000 adrenalin solution (allow the syringe to remain in position to prevent the escape of fluid); with the second syringe, after the lapse of five minutes, inject a solution containing from  $\frac{1}{12}$  to  $\frac{1}{2}$  grain (0.005 to 0.03 gm.) of cocain hydrochlorate.

Headache, nausea, and vomiting frequently occur; prevent the action of cocain from extending upward (the adrenalin aids in this) by keeping the patient's shoulders elevated throughout the operation (Bier). Anesthesia is produced in from two to twenty minutes, and usually lasts for several hours.

Close the puncture wounds after withdrawal of the needles with cotton and collodion.

**Dangers.**—Spinal hemorrhage; meningitis.

*Pathologic Effects.*—Pneumonia (aspiration or exposure); certain amount of fatty degeneration follows every anesthesia; acute suppression of urine.

*Mortality.*—Ether, 1 death to every 26,000 administrations; chloroform, 1 to every 10,000 to 16,000 administrations. Chloroform causes five times as many deaths as ether according to present published statistics. Nitrous oxid gas, 1 to every 120,000 to 150,000. Chief cause of death: Early, due to fright (vasomotor paralysis); later, to overdose.

## CHAPTER V.

### OPERATION.

OBTAIN the consent of the patient or of some responsible person (written, if in doubt) to do as much or as little as your judgment will direct.

**Time and Conditions Favoring.**—Morning (8 to 11 A. M. when patient is at his best); sunlight. Season of the year, spring or autumn. Age, ten to forty. Sex, female; mid-menstrual period. Habit; lean, muscular. Bedridden patients suffer less vital disturbance than the robust.

**Unfavorable Conditions.**—Infants and the aged; intemperate; obesity (due to mechanical obstruction of fat upon the vital organs, acid putrefaction, with an increased tendency for infection to take place); intercurrent disease; multiple operations. *Dangers:* Anesthesia (from overdose); avoid by directing the anesthetist to employ the minimum quantity and by keeping him informed of the progress of the work. Shock: reduce by conserving body-heat and by employing despatch in manipulations. Hemorrhage: the rapidity of the loss is more important than the quantity. Hemophilia: detect any tendency by studying the previous history. Air in the veins: according to some surgeons the danger from this cause is overrated; treat by lowering the head; finger compression; filling up the wound cleft with water; hemostatic forceps; ligature; stimulants; artificial respiration; saline injection (hypodermoclysis).

Avoid infection during operation: (a) Avoid infecting the subcutaneous tissues by changing scalpels after the skin in-



FIG. 71.—Antiseptic irrigator tip holder (original).

cision has been made. (*b*) Protect the peritoneal cavity from invasion by irrigation with hot sterile water, bichlorid 1 : 20,000 to 1 : 10,000, hydrogen dioxid 1 : 10 to full strength. Dry method best. Keep surfaces mopped dry throughout operation with sterile gauze pads. When opening abscess cavities protect surrounding structures and direct the flow by means of gauze packing or pads. (*c*) Provide for the escape of exudate by position; drainage. (*d*) Avoid tension in suturing soft parts. In laparotomy avoid leaving implements behind (by counting before and after operation) —gauze (by using gauze pads only, with strings which may be weighted with hemostats); employ pads in sets (four or seven), count before and after use; quilted gauze padding (made in yard lengths with tape attached, quilted gauze padding having tape or strong string attached with end passed through a bodkin or sail-needle, upon which all other pads are threaded); quilted pad containing pieces of sheet lead may be used to retract the intestine (gravity pad).

## CHAPTER VI.

### AFTER-TREATMENT.

REMOVE the patient to bed without exposure (retain operation blanket covering, if not soiled, until reaction takes place, after which remove surplus covers). Keep head level or lower than rest of the body (when carrying upstairs have patient's feet go up first; coming down, have head first).

The bed should have been freshly made and previously warmed by means of hot-water bags or bottles, hot-salt bags, hot bricks, or stove-lids wrapped in newspapers or flannel. Avoid burning when heat appliances are continued by placing them between the covers, and not in direct contact with patient's body-surface. Prevent soiling the mattress by a pad of newspapers, oil- or floor-cloth, rubber apron, sheet, or cloth. Support parts operated upon by pillows, sling, suspension apparatus, or double-inclined plane. An apparatus which adds greatly to the patient's comfort during convalescence is shown in Fig. 72. Enforce quiet, screening the bed from strong light or drafts. Expect discomfort and restlessness, also some pain; avoid too early recourse to opium.

Treat **postoperative nausea or vomiting** by: (a) Head level or a little lower than the rest of the body (stout patients and those having short necks may require elevation to overcome respiratory difficulty); swab patient's mouth and tongue with cold water; (b) hot water sipped, cracked ice, water, 1 to 2 fl. dm. (4-8 c.c.), acidulated with vinegar. Cocain (gr.  $\frac{1}{12}$ —0.005 gm.); silver nitrate (gr.  $\frac{1}{8}$ —0.008 gm.); calomel (gr.  $\frac{1}{100}$ — $\frac{1}{50}$ —0.0006—0.001 gm.); carbolic acid (gtt.  $\frac{1}{8}$ — $\frac{1}{4}$ —0.008—0.016 c.c.), mustard plaster to stomach; lavage; opium suppository (pulv. opii, gr. j—0.066 gm.); Ol. theobrom. (q. s.); (c) quench thirst by cracked ice held in the mouth; warm water enema 6 fl. oz. (192 c.c.), warm weak coffee 4 fl. oz. (128 c.c.).

**Food.**—Patients may go from six to forty-eight hours without food. First allow cold water (teaspoonfuls) or cracked ice to be sucked; champagne; if well borne, follow with milk, diluted with lime-water 10 to 50 per cent., peptonized, egg-water, toast-water, barley-water, beef-juice at intervals of two to four hours (small quantities frequently given should be the rule), gradually returning to solid food. To make barley- or oatmeal-water take two or three teaspoonfuls of barley or oatmeal, stir in a pint of water; boil until thoroughly soft; add a pinch of salt and sufficient



FIG. 72.—A bed grapple (original).

milk-sugar or loaf sugar to taste; carefully strain. Use this to dilute milk. Raw-meat pulp may be made more palatable by mixing it with a quantity of currant jelly. A concentrated meat-juice may be made as follows: take a piece of steak (rump) the size of an egg; toast it (broil) until slightly browned; squeeze all the juice and nutriment out by means of a meat-press. Give a teaspoonful every three hours.

**Convalescent Diet-list.**—Roast mutton, mutton chops, sirloin or tenderloin steak, roast-beef, roast or broiled chicken, stewed *young* chicken or squab, sweetbreads (boiled or



baked). In season, grouse, pheasant, quail, partridge, venison. *No* goose, duck, veal, pork, or bacon. The lean of boiled ham which is not salty is permitted. *No fat of meat*, only the muscle-pulp.

Fresh lean fish; eggs sparingly, preferably one yolk to two or three whites, soft boiled or sheered.

Rice; preparations of wheat, *wheatena*, shredded wheat (browned); Pettijohn's breakfast gem and crust of roll; dry toast; fresh butter.

All uncooked vegetables should be avoided. Vegetables should be eaten only when the bowels are not sore. Potatoes should first be mashed and then baked with a little cream. Beans, peas, carrots, *cooked* celery, asparagus, and sweet potatoes in moderate quantity only. No fruits or pastry.

**Rectal feeding**, consisting of half a pint milk beaten up with two eggs to which twenty grains of pepsin are added, may be carried out, one, two, or three nutritive injections being made in twenty-four hours.

Bowels should be moved by enema (soap-suds, glycerin); Epsom salts second or third day. Bladder emptied by use of catheter if necessary at the end of six or eight hours and at similar intervals thereafter. Employ a bed-pan until the patient is fully able to rise.

Dressings are to be changed and the wound examined only for cause: (a) Soiling discharge; (b) continued or rise in temperature; (c) hemorrhage; (d) disarrangement of the parts.

**Bathing**.—Alcohol rub or hot-water-and-soap washing without exposure daily unless contraindicated.

**Activity**.—Begin with gradual massage after the second or third day; use care: venous thrombosis has occurred. Patient's feelings after the divided tissues have united is criterion for proper time to arise in most cases. Encourage activity when debility follows close confinement.

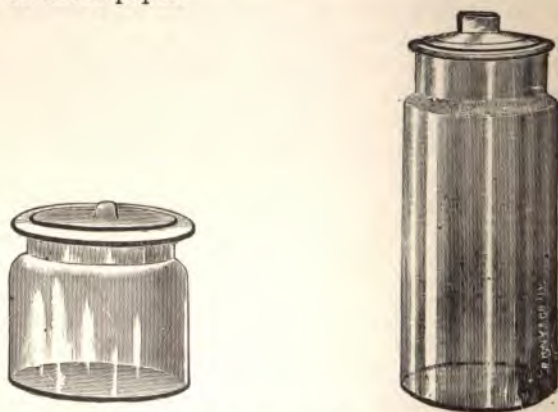
## CHAPTER VII.

### MICROSCOPIC TECHNIC.

SPECIMENS may be solid, fluid, with or without bacteria.

#### SOLID.

Select the most typical parts, fresh (living, or if from autopsy, secured within twenty-four hours). Keep specimens and reagents in jars (Figs. 73, 74) in the dark. To clean cover-glasses and slides use (ether, absolute-alcohol, flame) old linen or tissue-paper.



FIGS. 73, 74.—Specimen jars.

**Preservatives (Fixation).**—(1) *Formalin* (10 per cent. watery solution) best for organs or large pieces; keeps unchanged. (2) *Alcohol*—80 per cent. for ordinary work (cut up specimens into  $\frac{1}{4}$  inch (6 mm.) cubes); when strong, shrinks tissue; weaker, does not arrest decomposition. (3)

*Absolute alcohol* is useful to secure cellular effects and for bacteria specimens in  $\frac{1}{4}$  inch (6 mm.) cubes). (4) *Müller's fluid* (for brain, cord, nerves, eyes):

R. Potassium dichromate . . . . .	2.5 parts.
Sodium sulphate . . . . .	1 part.
Water . . . . .	100 parts.—M.

Soak three to six weeks; change the fluid when turbid.

(5) *Corrosive-sublimate solution* (1 in 80 per cent. alcohol) for cell study, specimen to remain ten to twenty-four hours; wash in running water to remove the black (mercurial) deposit; alcohol (80 per cent.). (6) *Flemming's solution* (for cell study):

R. Chromic acid (1 per cent.) . . . . .	15 parts.
Osmic acid (2 per cent.) . . . . .	4 parts.
Glacial acetic acid . . . . .	1 part.—M.

Soak twenty-four hours; wash twelve hours in running water.

**Hardening.**—Specimens (fixed) in alcohol harden by placing at once in absolute alcohol; for all other solutions use graded alcohols commencing at 50 per cent., then 60, 70, 80, 95, absolute, keeping in each twenty-four hours.

**Embedding.**—This process supports the tissues. (a) Simple (may be used for hasty examinations, does not penetrate):

R. Paraffin . . . . .	2 parts.
Tallow . . . . .	1 part.—M.

Mold about specimen, wet with alcohol (80 per cent.), when cutting sections.

(b) *Interstitial* (complete infiltration of the specimen occurs).  
(1) *Celloidin*:

R. Celloidin . . . . .	$\frac{f}{5}$ ss (16 c.c.).
Alcohol (absolute) . . . . .	$\frac{f}{5}$ ij (64 c.c.).
Ether . . . . .	$\frac{f}{5}$ ij (64 c.c.).—M.

Prevent evaporation while dissolving by refilling at intervals; make a second solution thick as syrup; dehydrate

by placing the specimen in absolute alcohol (twenty-four hours), then in a celloidin solution (thin) for twenty-four hours. Transfer to syrup solution for a period of twenty-four hours; mold, dry (opaque film); alcohol (80 per cent.).

(2) *Paraffin*: Dehydrate by placing in absolute alcohol for twenty-four hours, chloroform twelve hours, or until speci-



FIG. 75.—Teasing-needle.

men sinks; saturated solution of paraffin in chloroform twelve hours; melted paraffin (pure) for twenty-four hours or until permeation (test by hot needle until bubbles cease to rise); mold in paper box; cool slowly in water. Some specimens harden without embedding, as liver, kidney, some sarcomata. Study specimen by teasing (dissection with needles) (Fig. 75) or—

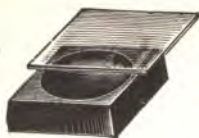


FIG. 76.—Section dish.



FIG. 77.—Drop bottle.

**Section Cutting** (with microtome).—For celloidin-embedded specimens cut obliquely; wet the microtome knife with 95 per cent. alcohol; for paraffin-embedded specimens cut dry, obliquely, right angles for ribbon sections; frozen specimens must be small ( $\frac{1}{4}$  inch (6 mm.) cubes); must be well washed, to free from alcohol; spray (ether) the under side of micro-



tome table, section in alcohol (95 per cent.) or salt solution (0.6 per cent.). (See Figs. 76, 77.)

**Staining.**—Owing to the selective power of tissues for stains we (by differentiation) secure contrast (cell substance and nucleus) and counterstaining.

1. **Hematoxylin.**—(a) Powdered alum, 20 gm., in water, 200 c.c. (b) Hematoxylin crystals, 2 gm., in alcohol (95 per



FIG. 78.—Section lifter.

cent.), 12.5 c.c.; dissolve and mix, expose to a strong light (not sunlight). Filter, add 50 c. c. each of alcohol (methyl) and glycerin. Cork tightly (Delafield).

*Method.*—Receive the section in water to allow it to spread out; transfer and stain (three to five minutes) (Figs. 78–80); wash well; transfer to alcohol (95 per cent.) two minutes.



FIG. 79.—Cover-glass forceps.



FIG. 80.—Alcohol section-lamp.

Clear (to render transparent) in oil of cloves; mount in Canada balsam; label.

## 2. Lithium-carmin:

R. Saturated aqueous solution of lithium carbonate (carmin No. 4) . . . . . 2 : 100.

Filter; receive the section in water; stain for five minutes; differentiate.



## Differentiating Fluid:

R. Hydrochloric acid . . . . .	1 part.
Alcohol . . . . .	70 parts.
Water . . . . .	30 parts.—M.

Three to five minutes (or until the section is transparent); wash well; dehydrate (alcohol 95 per cent.); clear (oil of cloves); mount in balsam; label (Weigert).

## 3. Bismarck-brown Solution:

R. Bismarck-brown . . . . .	3 parts.
Water . . . . .	70 parts.—M.

Heat to boiling, then add 30 parts of alcohol (95 per cent.); filter. Receive section in water, stain one and one-half minutes; wash in alcohol (80 per cent.) until faint yellowish-brown color; clean alcohol (95 per cent.) for one minute; clear (oil of bergamot two to three minutes); mount; label.

**Counterstaining (Double Staining).**—1. *Eosin*.—Receive the section in water; stain (nuclei); wash well in water; dehydrate and counterstain (eosin, absolute alcohol); clear in oil of cloves; mount; label; the intercellular substance is stained pink.

2. *Picric Acid*.—Receive the section in water; stain (nuclei); differentiating fluid, water, saturated alcoholic solution of picric acid (one drop of acid into 95 per cent. alcohol); allow to remain until slightly yellow; clear in clove oil; mount; label.

**Gram's method** (for staining bacteria in tissues).—Receive the section in Ehrlich's solution.

R. Anilin (C. P.) . . . . .	4 parts.
Basic anilin dye (saturated alcoholic solution) . . . . .	11 parts
Water . . . . .	100 parts.—M.

Stain for about fifteen minutes.

Gram's solution:

R. Iodin . . . . .	4 parts.
Iodid of potassium . . . . .	2 parts.
Water . . . . .	300 parts.—M.

Allow to remain two to five minutes; wash thoroughly in alcohol (95 per cent.); stain in Bismarck-brown solution for one-half minute; wash in alcohol (85 to 95 per cent.); dehydrate in strong alcohol (95 per cent. or absolute); clear (carbolxylol); mount (Canada balsam); label.

**Gabbet's Method** (for staining bacteria; especially adapted for determining the presence of tubercle bacilli).—Receive the specimen (sputum, urine) on cover-glass, press another cover-glass against the first, remove, and dry both in the air; fix (by passing three times through an alcohol flame); stain in Ziehl's carbol-fuchsin solution:

R. Fuchsin . . . . .	1 part (the stain).
Alcohol . . . . .	10 parts (the solvent).
Carbolic acid crystals (5 per cent. watery solution) . . . . .	90 parts (the mordant, secures penetration).—M.

Stain three to five minutes (heating carefully until steam is given off); wash in water; decolorize and counterstain in Gabbet's solution:

R. Methyl-blue . . . . .	1 to 2 parts (the counterstain).
Sulphuric acid . . . . .	25 parts (the decolorizer).
Water . . . . .	75 parts.—M.

One-half to three-fourths of a minute; wash; mount (Canada balsam).

Specimens sometimes contain bone; to decalcify:

R. Alcohol (70 or 80 per cent.) . . . . .	95 parts.
Nitric or hydrochloric acid (5 to 8 per cent.) . . . . .	5 parts.—M.

Requires six to ten weeks; change fluid five or six times; have large excess.

Clearing secures transparency: Oil (cloves, cedar, bergamot, turpentine); carbolxylol.

**Specimen (Tubercle Bacilli) in Tissues.**—Receive in water, allow it to spread, spread upon a clean glass slide, dry with blotting-paper (rub hard); fix (by passing through flame of an alcohol section-lamp (Fig. 80) once or twice carefully; stain for fifteen minutes, keeping the stain

warmed; wash with water (pipet) until no more red comes out; decolorize and counterstain one-half to three-quarters of a minute; wash with alcohol; dry with blotter; pass through flame once; mount. Tubercle bacilli will be colored red; tissue, blue. Beading in the stained bacilli is sometimes seen (probably due to too much heat during fixing or staining—shrinkage of capsule).

### FLUID.

**Urine.**—Secure a fresh specimen in a conic glass (clean) receptacle; settle (twelve hours). Note: *Color* (if dark red and transparent denotes hematuria; if dark red and opaque



FIG.—81.—Dissecting forceps.

(free red cells), hematuria); *transparency* (normally pale amber and transparent; if turbid, pathologic—question of phosphaturia arising from a diseased condition is unsettled);

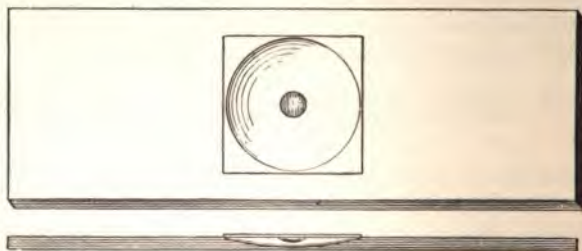


FIG. 82.—The "hanging drop" seen from above and in profile.

*tube-casts* (are sometimes found in very clear urine); *smell* (for poisons); *reaction* (use thick litmus-paper), normal acid; if alkaline indicates usually stale urine; *specific gravity*, 1020; test for—(a) *albumin* (boiling with addition of nitric



or acetic acid), nitric-acid-ring test; (*b*) *sugar*, reduction by Fehling's solution; study *sediment* by means of hanging-drop cover-glass (Fig. 82) method or pipet, a drop upon a glass slide; *gonococci*: secure a cover-glass specimen; dry; stain (methyl-blue) two to five minutes, warming meanwhile; wash well; dry; mount; control test by Gram's method (gonococci not stained).

**Blood.**—(*a*) Secure drop from finger-tip or lobe of ear (after sterilizing the skin surface) upon the cover-glass; press against another cover-glass; separate; dry (no heat); fix:

R. Absolute alcohol . . . . . f3ij (8 c.c.).  
Ether . . . . . f3ij (8 c.c.).—M.

Place cover-glass specimen in solution one to twenty-four hours (Nikiforoff); stain; wash; counterstain; wash; dry; mount. (*b*) Cover-glass specimen: dry (flame carefully); stain six seconds; wash (alcohol, 80 per cent.) or water; examine.

**Pus.**—Cover-glass specimen; stain (staphylococcus, streptococcus, bacilli (tubercle, typhoid, colon, pyocyaneus, pyogenes foetidus, anthrax, glanders), Micrococcus tetragenus, pneumococcus).

**General Examination to Determine the Presence of Bacteria in Anything.**—Spread on cover-glass with an oeza (a mounted platinum wire with loop at one end); allow to dry thoroughly; fix the material to the glass by passing three times through the flame of an alcohol-lamp (spoiled if browned) (moderate flame, circle one foot in diameter, one revolution per second, general rule); stain in aqueous solution of gentian violet, two or five minutes; wash well; dry; mount in Canada balsam; examine (always with the highest lens power). Never employ direct sunlight; white light (Welsbach); coal-oil, with flask (copper sulphate solution—blue tint imparted). Bacteria may be examined stained or unstained (to tell whether motile, use the hanging-drop method).

## URINALYSIS.

**Normal Urine.**—Color, yellow. Reaction, usually acid. Quantity in twenty-four hours, 40 to 50 fl. oz. (1500 c.c.). Normal specific gravity, 1015 to 1025 (Fig. 83).

A milk diet gives rise to early decomposition of the urine (sometimes becomes fetid before leaving the bladder).

**Mucus.**—Floats as a cloud toward the top of the vessel; may settle in time to the bottom.

*Test.*—By microscope (epithelium, clear fluid).

**Phosphates** are normal, and simply show presence of alkaline urine. Settle slowly.

*Test.*—Will be dissolved by the addition of nitric acid.

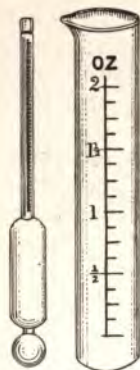


FIG. 83.—Urinometer.



FIG. 84.—Centrifugal machine.

*Microscope.*—Amorphous, stellar or rod-shape, "coffin-lid" prisms.

**Urates.**—Dissolved by heating.

*Microscope.*—Amorphous globules, dumb-bells.

**Indican.**—*Test.*—To equal parts of urine and nitro-hydro-chloric acid add slowly concentrated solution of chlorid of lime. If present, obtain indigo-blue color.

**Bile.**—*Test.*—Add a drop of fuming nitric acid to a smear of urine upon a porcelain dish. Bile is indicated by a play of color (Gmellin's test).



**Blood.**—Test by microscope; hemacytometer, hemoglobinometer (Fig. 85).

**Chyle.**—Gives rise to a milky color. Formation of pellicles of fat emulsion.

**Pus.**—Gives rise to dull, yellowish turbidity, increased by the addition of acid. Forms a thick, glairy fluid upon adding liquor potassæ.

*Microscope.*—Opaque, spheric, granular cells.

**Albumin.**—Not removed by filtration.

*Test.*—Boiling, followed by the addition of nitric acid; white precipitate. *Ring-test* (Heller's): To a small quantity of nitric acid in a test-tube add an equal quantity of urine by allowing it to trickle down the sides of the tube. Albumin is indicated by a white ring at the junction of the urine and acid.

**Sugar.**—Specific gravity about 1040.

*Test.*—To 1 fluidram of Fehling's solution add 4 fluidrams of water; heat to the boiling-point. Add urine, a few drops at a time, reheating to the boiling-point after each addition of urine. Sugar indicated by red (cuprous oxid) or yellow (cuprous hydroxid) precipitate.



FIG. 85.—Gowers' hemoglobinometer.

## TABLE OF EQUIVALENTS.

Apothecary's Grains or minims.		Metric Grams or cubic centimeters.		
$\frac{1}{200}$	=	0.0003	=	$(\frac{2}{10000})$
$\frac{1}{150}$	=	0.0004	=	$(\frac{4}{10000})$
$\frac{1}{100}$	=	0.0006	=	$(\frac{6}{10000})$
$\frac{1}{80}$	=	0.0008	=	$(\frac{8}{10000})$
$\frac{1}{64}$	=	0.001	=	$(\frac{1}{1000})$
$\frac{1}{32}$	=	0.002	=	$(\frac{2}{1000})$
$\frac{1}{16}$	=	0.004	=	$(\frac{4}{1000})$
$\frac{1}{12}$	=	0.005	=	$(\frac{5}{1000})$
$\frac{1}{8}$	=	0.008	=	$(\frac{8}{1000})$
$\frac{1}{6}$	=	0.011	=	$(\frac{11}{1000})$
$\frac{1}{4}$	=	0.016	=	$(\frac{16}{1000})$
$\frac{1}{3}$	=	0.022	=	$(\frac{22}{1000})$
$\frac{1}{2}$	=	0.033	=	$(\frac{33}{1000})$
$\frac{2}{3}$	=	0.044	=	$(\frac{44}{1000})$
1	=	0.066	=	$(\frac{66}{1000})$
2	=	0.133	=	$(\frac{133}{1000})$
5	=	0.333	=	$(\frac{333}{1000})$
10	=	0.666	=	$(\frac{666}{1000})$
15	=	1.000	=	(1)
20	=	1.333	=	$(1\frac{1}{3})$
30	=	2.000	=	(2)

Drams or Fluidrams.		Grams or cubic centimeters.		Troy ounces or Fluidounces.		Grams or cubic centimeters.
1	=	4		1	=	32
2	=	8		2	=	64
4	=	16		4	=	128
6	=	24		6	=	192
				8	=	256
				12	=	383
				16	=	512

437½ grains	=	15 (Avoir.)	=	28.3 gm.
480 "	=	15 (Troy or Apoth.)	=	32 "
kilo (K)	=	1000 gm.	=	2.2 lbs.
Liter (L)	=	1000 c.c.	=	0.976 qt.
Meter (M)	=	1000 mm.	=	39.37 inches
		100 cm.	=	40 in. (nearly)
		5 cm.	=	2 in.
		2.5 cm.	=	1 in.

## CHAPTER VIII.

### BACTERIOLOGY.

**Description.**—A bacterium is a vegetable (because living by osmosis and exosmosis) unicell containing microprotein. Percentage composition in 100 parts of dried organisms is made up of:

Microprotein . . . . .	84.2 parts.
Fat . . . . .	6.04 "
Ash . . . . .	4.72 "
Other substances . . . . .	5.04 "
	<hr/> 100.00

Every bacterium has a cell-wall and a large nucleus ; some give the starch reaction with iodine ; ordinarily stain with anilin dyes (nucleus unseen because it is also stained) ; sometimes surrounded by gelatinous halo (capsule) ; flagella numerous (as in Eberth's bacillus of typhoid fever) ; single (comma bacillus of cholera) ; many are motile (due to contraction of protoplasm inside cell capsule (flagella, ameboid, streaming motion). Brownian movement is a deceptive sparkle of bacteria simulating motion ; detect by noting relative positions.

**Measurements.**—Measured by means of an eye-piece (micrometer) containing platinum wire or cobweb. Micromillimeter = 1 thousandth m.m. =  $\frac{1}{2500}$  of an inch (cocci are smallest sized, spirilla largest sized, organisms). Cocci, 0.15 to 2  $\mu$  ; bacilli, 1 to 5  $\mu$  in length by 2 to 1.5  $\mu$  in width ; spirilla 5 to 40  $\mu$  in length. Average weight, one-billionth of a gram.

**Propagation.**—(1) Fission, (2) sporulation. No karyokinesis in bacteria multiplication ; life of one generation fifteen to forty minutes ; one bacterium forms two in one hour ; when conditions for development are poor, spores are grown (called endospores when fully grown) ; spores are freed by breaking up of the parent cell (they appearing as highly refracting bodies).



Spores are—(a) Endogenous (spore inside the individual); (b) arthrogenous (the whole individual is the spore or develops into it); very tenacious of life (unaffected by cold) cell-wall of spore preventing evaporation of contained moisture; escape from ends or side of parent (arthrospore when entire micro-organism changes into permanent spore).

**Classification.**—Bacteria are divided according to shape: (A) Monomorphous (constant shape) (cocci, bacilli, spirilla); (B) pleomorphous (rare, spirals with leptothrix): (1) Cocci (spheric)—(a) diplococci (dumb-bell); (b) tetragenococci (division in two directions upon the same plane); (c) staphylococci (grape-cluster); (d) streptococci (chain); (e) sarcinæ (cubic masses); merismopedia (division in fours, eights, sixteens); (f) ascococci (gelatinous substance surrounding); (g) leuconostoc (cartilaginous substance surrounding). (2) Bacilli (rod-shape): (a) Clostridium (diameter of a contained spore is greater than the bacillus, which latter is bulged in the middle in consequence); (b) trommelschläger (drum-stick); (c) vibrio (flexible); (d) spore with long filament; (e) myconostoc (bacilli with coiled threads in gelatinous substance); (f) leptothrix (long filaments attached to end of bacilli or jointed filament); (g) streptothrix (tree-branch filaments attached to bacilli); (h) cladothrix (similar formation); (i) beggiatoa (filaments thick and coarse). (3) spirilla (corkscrew): (a) Spirocheta (flexible spiral); (b) spiromonas (flat); (c) spirolena (spindle); (d) ophidiomonas (spiral, containing sulphur granules).

**Staining.**—Staining is difficult, owing to capsule resistance. Spread the specimen thinly over a cover-glass; dilute (drop of culture in drop of water (distilled), drop of this in another drop of water; repeat); dry; fix; place in test-tube containing carbolfuchsin; boil fifteen to thirty minutes; remove; decolorize (hydrochloric acid, 3 per cent. watery solution); wash well (water); counterstain; wash; dry; mount.

**Flagella.**—*Löffler's method* (requires three solutions):

- |        |   |            |
|--------|---|------------|
| (a) R. | Tannic acid (2 per cent. solution) . . .                  | 10 parts.  |
|        | Ferrous sulphid (cold, aqueous solution) . . . . .        | 5 parts.   |
|        | Alcoholic solution of fuchsin and methyl-violet . . . . . | 1 part.—M. |



(*b*) Caustic soda, 1 per cent. solution.

(*c*) Sulphuric acid, aqueous solution of such strength that 1 c.c. will neutralize 1 c.c. of solution (*b*).

Dilute specimen upon cover-glass; dry; fix (flame); add (*a*) (filter (*a*) before each using); steam one-half to one minute (ruined if boiled); wash (distilled water); absolute alcohol until decolorized; now add by drops Ehrlich's solution (neutral) of fuchsin (add solution (*b*) to ordinary Ehrlich's until opaque); wash; dry carefully; mount. Specimen showing no flagella due to (*a*) none present; (*b*) if the culture is alkaline, use (*b*) so that 1 drop is added to 1 c.c. up to 16 c.c. of (*a*); if acid culture, use (*c*), 1 drop to 1 c.c. up to 16 c.c. of (*a*). Thus obtain right strengths of solutions cholera requires  $\frac{1}{2}$  or 1 drop of (*c*); typhoid, 1 c.c. of (*b*); malignant pustule, 36 of (*c*).

*Bunge's Method.*—To 10 c.c. of concentrated watery solution of tannin, 3 parts; liquor ferri chloridi (1:20), 1 part, add a watery concentrated solution of fuchsin; stain five minutes (warming toward the end); wash; dry; stain with carbolfuchsin solution.

**Distribution.**—Universal: air, water, earth, food, in body, on body, skin, nails, body-openings (mouth, nose, intestines, genitals); are not ubiquitous (absent in high altitudes or in glacial ice), though present wherever man or animals are found; normally never found in body-juices or tissues. Beneath the surface of the earth (one meter, few found); the number rapidly decreases until there is an entire absence.

**Transmission.**—Respiratory and digestive systems, skin and mucous membrane (open wounds), uterine.

**Phenomena.**—Affected by—(1) Oxygen: (*a*) aerobic, require oxygen; (*b*) anaerobic, growth inhibited by oxygen; (*c*) optional or facultative anaerobic, grow in both. (2) Relation to nutriment: grow best where diffusible albumins are found; some require water, blood, serum; may be accustomed to other media (addition of glucose or glycerin may assist). (3) Moisture: amount needed varies (80 per cent. best). (4) Light: electric, direct sunlight, blue lights destroy growth in time (some chromogenic, show only in a diffused light). (5) Reaction: grow best in neutral or feebly alkaline

solutions (molds grow best in acid solutions). (6) Electricity: influence unknown; powerful discharges destroy. (7) Motion: rest best, slow flowing not prohibitive; violent agitation destroys (thus running streams with waterfalls are better drinking-water than that from a slow, deep river). (8) Temperature: majority grow best at ordinary temperature, some at fever-heat; tubercle bacilli,  $38^{\circ}$  to  $40^{\circ}$  C. ( $100.5^{\circ}$  to  $104^{\circ}$  F.); freezing kills some forms of adult bacteria, but no spores; from  $10^{\circ}$  to  $40^{\circ}$  C. ( $50^{\circ}$  to  $104^{\circ}$  F.), bacteria do not grow; from  $60^{\circ}$  to  $75^{\circ}$  C. ( $140^{\circ}$  to  $167^{\circ}$  F.), most die; spores can resist boiling water ( $100^{\circ}$  C.— $212^{\circ}$  F.) from five to thirty minutes;  $150^{\circ}$  C. ( $302^{\circ}$  F.) kills everything in one hour;  $175^{\circ}$  C. ( $347^{\circ}$  F.) kills everything in from five to ten minutes.

**Effects.**—(1) Odors (due to production of new principles); phosphorescence (sea-water bacteria); aromatic substances (indol produced by "comma bacillus" (spirillum), phenol; nitrites reduced by some. (2) Disease is one of their vital manifestations; (*a*) pathogenic (disease producers); (*b*) non-pathogenic (not disease producers). No line of distinction, because they may cause disease by obstruction, local inflammation (irritation of foreign bodies), septic toxins, by combination. (3) Fermentation: Alcoholic, due to yeast; acetic, due to *Bacillus aceticus* or *Mycoderma aceti*; lactic, due to *Bacillus acidi lactici*. (4) Putrefaction: (*a*) Reaction of bacteria upon nitrogenous organic matter; (*b*) forms peptone-like substances which change into (aromatic compounds) and ptomaines. A ptomain is an alkaloidal reaction of bacteria upon organic matter. Bacteria may be—(*a*) septic; (*b*) toxic; (*c*) irritating. (5) Chromogenetic action (color production); non-chromogenetic (non-producers); most chromogenetic bacteria are saprophytic; the bacteria do not produce color, but substances which unite; all colors produced, sometimes two colors; pigment best seen near surface, occupies almost all the cellular protoplasm, but never found in intercellular substance between the bacteria; oxygen and light necessary for most. (6) Gelatin liquefied, due to substance in bacteria excrement (destroyed by heat and formalin). (7) Acids produced by some; test by litmus and by means of rosolic acid. (8) Gases;  $\text{CO}_2$  (carbon dioxide);  $\text{H}_2\text{S}$



(hydrogen sulphid);  $\text{NH}_3$  (ammonia)—if bacteria near surface of medium, nothing seen; if deeply situated, may then see bubbles.

**Immunity** is an inherent power to resist disease. It may be natural (constant resistance)—for example, a white rat in health is not susceptible to anthrax—or acquired (result of accidental circumstances); slight or previous attack of the disease may protect only temporarily; an attack of diphtheria protects the individual for a month; protection after scarlatina varies; yellow fever never returns. Acquired

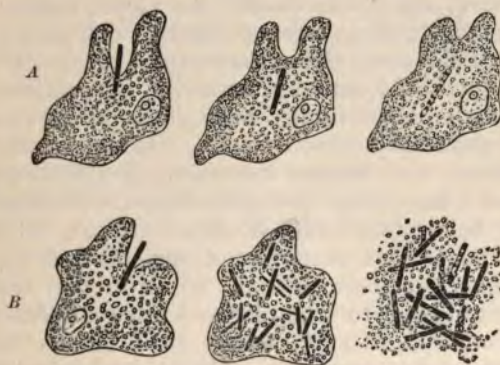


FIG. 86.—Phagocytosis: *A*, Successful; *B*, Unsuccessful (Senn).

immunity is less complete than natural immunity. Immunity may be produced experimentally (vaccination).

**Conditions Decreasing Natural Immunity.**—(1) Alterations in normal temperature; (2) changes in blood due to chemic substances; (3) diet; (4) removal of certain organs (as the spleen); (5) combinations of bacteria (may cause increase or decrease, depending upon attenuation (strength) of the culture).

**Theories for Immunity.**—(1) Pasteur's exhaustion theory is that bacteria in the body use up all the substance in the economy necessary for its life. (2) Retention theory is opposite to the last. It is that the growth of bacteria causes new substance by which they are destroyed. (3) Phago-

cytosis (Fig. 86) is the swallowing of bacteria by body-cells—phagocytes (ameboid cells) fixed, in connective tissue, (when free are called leukocytes, though all leukocytes are not phagocytes, lymphocytes are not). Phagocytes have no cell-wall; the attraction force (chemotaxis), if drawn toward the infecting organisms, is known as positive chemotaxis; if repelled, as negative chemotaxis. Chemotactic action is constantly going on in the human body. (4) Humeral theory is that destruction of bacteria is due to blood plasma. (5) Theory of defensive proteids is that there are constantly present in the body immunizing principles (alexins). These in natural immunity are called sozins; in acquired, phylaxins; these are two forms, one acting upon bacteria, one upon some of the toxins (ptomains). In natural immunity mycosozin acts on bacteria; toxosozin acts on toxins; in acquired immunity mycophylaxin acts on bacteria; toxophylaxin acts on toxins. General term, antitoxin. Animals may become immune by gradually (dilution of the poison) increasing strength; thus cobra or tarantula poison may be increased until 60 times ordinary lethal dose may be taken; other examples of mineral and vegetable poisons—nicotin, arsenic, opium. (6) Vibration theory is that immunity is due to irregular and unequal vibrations in tissues and antitoxins.

*Antitoxins* are not germicidal; cannot explain natural immunity by them; they have limitations, and it is unlikely that they will fulfil all expectations. They are useful only in toxic diseases (diphtheria, typhoid, rabies, tetanus). The typhoid antitoxin so far produced is too feeble to be of use; that of tetanus is required in such strength that it kills the animal. Alexins are germicidal. Antitoxins are found only in animals artificially immunized. These are stable compounds, not destroyed by antiseptics; each is specific only in its specific disease. The horse is used to produce antitoxins on account of the large amount of blood which may be drawn. Antitoxin commences to be formed when 150 times the lethal dose is reached. Drawn blood is then allowed to clot (serum is antitoxin). Preserved by antiseptic (camphor, carbolic acid, 1 per cent., salicylate of soda, 1 per cent., or



tricrosol). The strength of antitoxin is denoted by units—(a) normal; (b) immunizing; (c) antitoxin. "Immunity unit" is the amount of antitoxin necessary to protect a 500 gm. guinea-pig from 10 times minimum fatal dose of toxin used.

**Culture-media.**—Necessary to obtain pure cultures (should be similar to body composition). The simplest is **bouillon** (soup). To make a liter take one pound of lean meat (no fat or bones); grind or chop it fine; add one liter of clean water, and stand in a cool place twenty-four hours; express through a cloth; add enough water to make up amount. This is called a meat infusion; add 10 gm. Witte's Dried Peptone of Beef and 5 gm. of salt; boil one hour. All the albumin is coagulated and reaction is acid (presence of sarcolactic acid); neutralize, or make slightly alkaline by adding a solution of strong sodium carbonate or potassium hydrate; boil thirty minutes; filter; sterilize (employ intermittent method by placing for fifteen minutes each day for three or four days, in streaming steam).

To make from beef-extract add to 2 gm. of beef-extract one liter of water, 10 gm. of Witte's peptone, 5 gm. of salt; boil ten minutes; filter when cold; neutralize or make alkaline.

Use **thyroid extract** as basis of culture instead of meat in cultivation of typhoid germs; thymus-gland extract or pancreas extract in diphtheria; veal extract in tuberculosis.

**Gelatin culture** consists of bouillon to which 10 per cent. gelatin is added so that it becomes hard on cooling.

**Method.**—Make meat infusion; add 100 gm. of "Gold-label Gelatin"; boil one hour; neutralize with sodium carbonate or potassium hydrate; add the white of one egg mixed up with water; boil thirty minutes; filter (hot); melt; mold; sterilize.

Turbid bouillon is useless; to preserve bouillon fresh it should be kept in a cool place or on ice.

Bacteria grow best in a feebly alkaline medium.

**Agar-agar** is a Japanese moss. It is impossible to make a perfectly clear solution.

**Method.**—Add 1 or 1.5 per cent. of agar-agar to bouillon; cook bouillon in an open pot; add 10 or 15 gm. of finely cut

agar-agar; boil one to one and one-half hours, replace what water evaporates; add whites of one or two eggs stirred up in water; boil one hour. Filter while hot by slow process (as it filters faster when acid, neutralize afterward).

**Gelatin** differs from bouillon in that it is solid. Agar-agar is not so transparent as gelatin or so easily worked, higher temperature being required.

**Blood-serum medium** almost exactly represents body-juices, but is a dead product. Heat and coagulation removes its germicidal properties.

*Method.*—Bullock's blood obtained in a sterile jar; coagulate in a tilted position; pipet off serum into test-tubes; sterilize in inclined position (bacteria grow only upon surface of this medium); heat to 75° C. (167° F.) for thirty minutes; repeat daily for four or five days; complete sterilization by intermittent method (use cooled steam; hot causes bubbling and spoils the medium). Advantage of using blood-serum is nearest to human body composition; disadvantage, cannot change or be interfered with, else the bacteria will be destroyed.

**Löffler's blood-serum** consists of blood-serum, 3 parts; glucose and bouillon solution, 1 part.

**Moist-chamber process (Double Dishes)** (Fig. 88).—Sterilize the lower dish; place a piece of blotting-paper in the bottom of the dish; pour in bichlorid (1 : 1000); draw off, leaving the moist paper, which is the medium.

**Milk Medium.**—Secure removal of fat (the product of dairies where centrifugal method of cream separation is used, or place milk in a receptacle fitted with a stop-cock; cream collects on top; draw off milk from below); place in test-tubes; render alkaline; sterilize.

**Litmus milk medium** consists of milk to which a drop or two of watery solution of litmus (gives a faint blue color, alkaline reaction) has been added. By this means we are able to tell whether bacteria cause acid reaction or not by discoloration which would be produced. To overcome presence of fat (almost constant) in milk-medium specimens add drop or two of ether upon the cover-glass and blow off upon a towel (fat being dissolved by this means).

**Potatoes.**—Used first simply boiled. (a) Take good white potatoes; scrub; soak in a solution of bichlorid (1 : 1000); boil or steam for one hour (completes the sterilization and cooks the potato); cut in half with a sterile knife; place in a moist chamber. (b) Take potatoes and core them with apple-corer or brass cork-borer; cut diagonally across the



FIG. 87.—Incubator.



FIG. 88.—Moist chamber.



FIG. 89.—Smith's fermentation-tube.

cylinders; place in tubes and wash several hours in running water (prevents discoloration by washing out the starch(?)); sterilize by intermittent method.

**Peptone solution medium (Dunham's solution):**

Sodium chlorid (salt) . . . . .	0.5 per cent.
Peptone . . . . .	1 per cent.
Water . . . . .	q. s.

M. Boil until thoroughly dissolved; filter (is colorless).

Best medium for indol. Add rose-anilin (1 per cent.) or litmus to this medium to determine the reaction of bacteria exhibited.

**Eggs** as a medium may be used raw (puncture and introduce the culture; seal with collodion; have thus an airtight, sterile medium). Cooked (boiled hard). If stale,



better, because the yolk removes to one side and enables more slices to be made. Slice off and sterilize.—*Pyocyaneus aureus* on egg-medium gives rise to fluorescein (greenish discoloration); on peptone, pyocene.

**Cultures.**—To study organisms, must have them isolated (pure); impossible by Pasteur's dilution method. Not until solid media were used could pure cultures be obtained. Boiled potato used first (substance spread on over whole surface; thus groups forming colonies were formed). Pick off the colonies desired with an oeze.

**Gelatin Used with Plates.**—Require a tripod, glass dish with ground-glass edge to hold ice and water, circular



FIG. 90.—Complete leveling apparatus for pouring plate cultures, as taught by Koch.

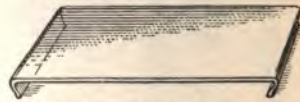


FIG. 91.—Glass bench.

(ground glass near edge) plate to cover dish, bell-glass, spirit-level (Fig. 90), iron box to sterilize glass plates, three test-tubes (distinguish contents of diluted specimens by number of twists in cotton plugs), moist chamber apparatus, bridge to hold plates (Fig. 91).

**Method.**—Set up the tripod; place plates filled with ice; put on the plate cover; level up; place one of the square plates on the cover-glass; pour on one of the tubes of melted gelatin containing the culture; when set, remove the plate quickly to moist chamber, setting on a bridge. Repeat same process with each of the other tubes, pouring out on the cold plates. Let the plates stand in a moderate temperature for twenty-four hours, when the spread-out culture



will have dotted the surface. Now place the plate under a low-power microscope. Carefully, with a sterile oeze (Fig. 92), remove desired colonies to other tubes or culture-media (Fig. 93); these are pure cultures. If bouillon is the media, transfer by stirring (same for all liquid media); if gelatin, invert the tube (prevents organisms falling in) and puncture,

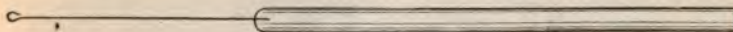


FIG. 92.—Platinum needle (oeze).

gelatin being solid; if agar-agar, hold tube horizontal, remove cotton plug, make single or zigzag stroke with the oeze.

**To Dilute for Plate Method.**—Have three tubes containing gelatin; take a fourth, containing the culture; with an oeze



FIG. 93.—Method of holding tubes during inoculation.

transfer a drop or two of culture into one of the gelatin tubes; stir up; then take a sample of this (drop or two) and stir into a second tube of gelatin; repeat with the third tube.

A *colony* of bacteria (Fig. 95) is a family the offspring of a single individual.

A *mycoderma* is a surface-growing colony upon the culture-medium.

A *zoöglea* is a colony growing upon the bottom of the culture-media in masses.



FIG. 94.—Esmarch tube on block of ice (redrawn after Abbott).

Cultures in bouillon, if not motile, are found at the bottom; if motile, found in lines (Fig. 96). Depending upon the amount of oxygen present will the culture vary; *aërobic*



FIG. 95.—The various appearances of colonies of bacteria under the microscope: *a*, Colony of *Bacillus liquefaciens parvus* (Lüderitz); *b*, colony of *Bacillus polypiformis* (Liborius); *c*, colony of *Bacillus radiatus* (Lüderitz).

grow upon surface. Cultures in peptone medium act similarly to those in bouillon, with a few exceptions (pyocyanic

forms). In milk may produce change of reaction, cause coagulation (coagulating ferment formed), or give rise to a material like mucus. On gelatin, anthrax, for example, will, after six hours, form a straight line, then cross-lines, finally like an inverted evergreen-tree, gelatin melting at the top and gradually liquefying in the course of two or three days (characteristic of anthrax growth). In *mycoides* see straight central line with crossed lines, dense surface growth; whole finally melts down. Typhoid bacillus does not melt gelatin (note some melting about air-bubbles, some in straight lines,

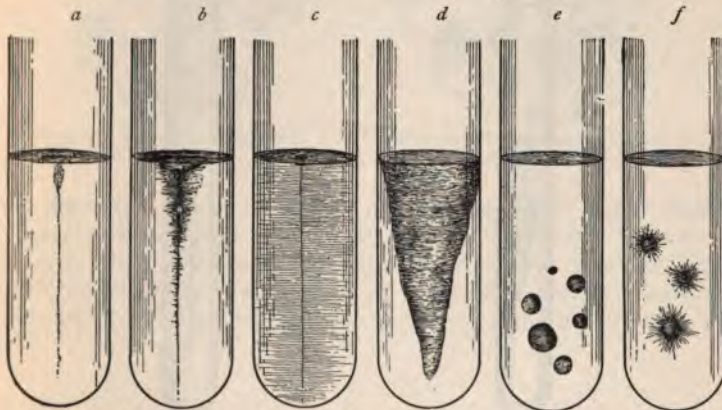


FIG. 96.—Various forms of gelatin puncture cultures: *a*, *Bacillus typhi abdominalis*; *b*, *B. anthracis*; *c*, *B. mycoides*; *d*, *B. mesentericus vulgaris*; *e*, *B. of malignant edema*; *f*, *B. radiatis*.

some cross, groups radiating from air-bubbles). In agar-agar growths may be wrinkled, colorless or not. A simpler method than the plate method for culture growing (Petri dish method) consists of small dishes and covers. Use directly instead of moist chamber.

**Esmarch Method.**—Use a culture-tube only (placing rubber cap over the stopper); place in iced water and roll to make a film around the inner side. These methods do not apply to liquid media or blood-serum.

Anaërobic organisms are best (Fig. 97) grown in hydrogen gas.



**Hesse's Method** (Fig. 98).—Use long test-tube containing water; this boiled, culture introduced; then oil or paraffin (to exclude air).

**Koch's Postulates, Koch's Circuit.**—To prove that a microbe is the cause of a given disease it must—(1) Be found always associated with the disease; (2) be capable of forming pure cultures outside the body; (3) these cultures



FIG. 97.—Buchner's method of making anaerobic cultures.



FIG. 98.—Hesse's method of making anaerobic cultures.

must be capable of producing the disease; (4) the microbe must be found associated with the artificially produced disease.

### BACTERIA OF SURGICAL IMPORTANCE.

**Pus-producers.**—(1) **Constant.** (a) *Staphylococcus pyogenes aureus* (made up of grape clusters) (Fig. 99), 0.7 to 0.85 mm. in diameter, are almost constantly present upon the body-surface (skin, nails, mouth, nose, ears) and in dust. Stains readily, grows in all media (orange-yellow culture in



gelatin, which is liquefied by the growth); (*b*) *Staphylococcus pyogenes albus* and *citræus* (lemon-yellow culture on medium) are less common forms; (*c*) *Streptococcus pyogenes* occurs in chains of six or eight links (Fig. 100), 1 mm.



FIG. 99.—Pus with staphylococci ( $\times 800$ ) (Flügge).

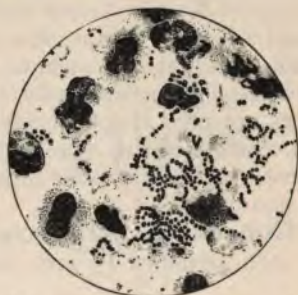


FIG. 100.—*Streptococcus pyogenes* in pus ( $\times 1000$ ) (Fränkel and Pfeiffer).

in diameter; does not liquefy medium (gelatin); forms small colonies which first are whitish, later become of a brownish color. It is nonmotile and stains by Gram's method; (*d*) streptococcus of erysipelas is of a similar form; (*e*) *Bacillus pyocyaneus* (Fig. 101) (blue or green pus) motile, forms pyo-



FIG. 101.—*Bacillus pyocyaneus* ( $\times 700$ ) (Flügge).



FIG. 102.—*Bacillus typhosus*: *a*, ordinary form ( $\times 1000$ ); *b*, flagellate form ( $\times 1500$ ).

cyanin; (*f*) *Bacillus pyogenes fœtidus* causes offensive odor; grows in most media; does not liquefy gelatin. (2) **Occasional:** (*a*) Typhoid (Eberth) bacillus (Fig. 102) is 1 to 3 mm. long, 0.5 mm. wide, motile, 18 to 20 flagella, is parasitic

(living in an animal body) or saprophytic (living upon dead organic matter outside the body, also in water and food, as milk, oysters, vegetables). It is stained by Löffler's (best); very virulent; potato culture best; closely resembles colon bacillus. (b) *Bacillus coli communis*: short, thick, motile, 12 to 16 flagella, forms indol, coagulates milk, is the principal cause of suppuration in typhoid fever, although normally present in intestine. In animals which have been protected experimentally by antitoxins (typhoid antitoxin does not protect from toxin of coli bacillus, and vice versa). (c) *Pneumococcus* (lanceolate) stains by Gram's method (best); may be grown in bouillon, forming pairs or chains; is non-motile.

**Gonococcus (Diplococcus)** (Fig. 103).—This bacillus is non-motile, 1.25 mm. in diameter, difficult to cultivate



FIG. 103.—Gonococci free and on the cells (Bumm).

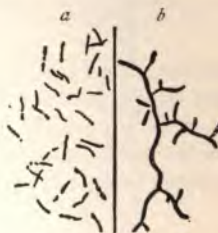


FIG. 104.—*Bacillus tuberculosis*: a ( $\times 1000$ ); b, ramified or branching form.

(except upon blood-serum, isolated), stains readily with methyl-blue, not by Gram's method (control test); power of deep cell penetration.

**Tubercle Bacillus.**—(Fig. 104).—This is non-motile, has no flagella, is 2 mm. long and 0.2 mm. wide, occurs in pairs or chains (beaded, due to action of stain), difficult to stain, parasitic, aerobic, culture upon glycerin, gelatin, glycerin-agar, blood-serum.

**Tetanus (Drum-stick Bacillus)** (Fig. 105).—It is anaerobic, stains by Gram's method, virulent and resistant, grows on all media (liquefies gelatin), has hay-like odor.

**Bacillus of Malignant Edema** (Fig. 106).—It is long

and slender, 1 mm. wide by 2 to 10 mm. long, motile (flagella), anaërobic, stains (anilin), saprophytic, evolves gas, spore (large) formation.

**Bacillus of Anthrax** (Fig. 107).—Causes splenic fever or anthrax in animals, malignant carbuncle or pustule

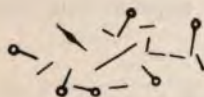


FIG. 105.—*Bacillus tetani*; cover-glass preparation from culture by Kitasato.



FIG. 106.—*Bacillus oedematis maligni*: *a*, ordinary form ( $\times 1000$ ); *b*, flagellate form ( $\times 1200$ ).

(wool-sorter's disease). Bacilli are delicate, but their spores (glisten) are tenacious, and used as standard for testing powers of disinfectants. Bacilli are 1 mm. wide by 5 to 15 mm. long, thread chains, stain readily, liquefy gelatin (puncture, inverted evergreen-tree form).



FIG. 107.—*Bacillus anthracis*, ( $\times 1000$ ).



FIG. 108.—*Bacillus mallei*, ( $\times 800$ ).

**Bacillus Mallei** (Fig. 108).—The glanders bacillus is short, thick (10 mm. wide by 0.1 mm. long), non-motile; grows on potato (honey formation), blood-serum; stains by *Kühne's method*. Place specimen in a solution made of



methyl-blue, 2 parts; alcohol (absolute), 8 parts; carbolic acid (5 per cent. watery), 90 parts for twenty to thirty minutes; wash (water); decolorize (5 drops—0.333 c.c. of hydrochloric acid in 8 ounces (256 c.c.) of water); place in lithium carbonate (saturated solution, 6 drops—0.399 c.c.—to 2 drams (8 c.c.) of water; wash (distilled water), alcohol (absolute), colored methyl-blue; wash in oil (clear), ethereal oil, xylol; dry; mount.

**Streptothrix.**—Gives rise to mycetoma (Madura foot), an affection of ball of great toe, pads of fingers and toes in East Indian farmers (result from thorn scratch); in a few weeks induration, nodules, later suppuration containing



Fig. 109.—Actinomyces (Coplin and Bevan).

grains (melanotic), black like gunpowder, or pale pink like shad-roe. The bacillus is aerobic, does not dissolve gelatin, stains by Gram's method (shows infiltration of small round-cells), grows well on acid vegetable infusions, milk also (requires 10 to 30 days), colonies size of pea, bright rose-red color near edge of medium.

**Actinomyces** or **ray fungus** (Fig. 109), gives rise to actinomycosis. It is roset shape (composite), it is true bacillus around a central spore, stains by Gram's method.

**Klebs-Löffler bacillus** (Figs. 110–112) is the cause of diphtheria. It is 1 mm. long by 0.4 to 0.6 mm. wide, irregular in its form (peculiarity), optionally anaerobic, stains in



cultures by *Löffler's method* (*Gram's method* for tissues); grows on all media, best on Löffler's medium: Glucose, 1 per cent.; bouillon, 1 part; blood-serum, 3 parts.

**Pseudodiphtheria bacillus** is probably an attenuated form of the true diphtheria bacillus. It is not pathogenic to



FIG. 110.



FIG. 111.



FIG. 112.

#### BACILLUS OF DIPHTHERIA.

FIG. 110.—Tube inoculated forty hours after serum-injection.

FIG. 111.—Tube inoculated forty hours after admission. The diphtheria bacilli are smaller and more regular in form than the preceding.

FIG. 112.—Tube inoculated from growth forty-eight hours old. Irregular staves, staining, for the most part, very unevenly. The bacilli seem to tend to the formation of short chains. Few ovoidal bodies are present.

lower animals, and is shorter than the true form when grown on blood-serum.

**Spirillum of Cholera (Comma Bacillus)** (Fig. 113).—No way of distinguishing from bacilli of *Gamaleia*, Dunbar, Danubian (Danube River), *Berolinensis* (Berlin), Miller, *aquaticus*, Wernicke, Bonhoff. It is short (half the length



FIG. 113.—Comma bacillus: *a*, Ordinary forms; *b*, flagellate forms ( $\times 1000$ ).

of tubercle bacillus), stout, and curved on itself, motile (single flagellum from one end) under unfavorable conditions (spiral threads are formed), cannot live in acid media, stains

easily with fuchsin (aqueous solution). Treat a "rice body" upon cover-glass by teasing; when placed on gelatin liquefaction occurs, giving rise to a powdered-glass appearance. Produces indol (test with  $\text{H}_2\text{SO}_4$ ; few drops causes a red color) and nitrites.

**Lepra bacillus** gives rise to leprosy. It is almost the same size as the tubercle bacillus, but is a little shorter, is straight, and stains easier. The bacilli occur singly or in groups (irregular); stain well by Gram's method; beading occurs, no spores; bacilli are immotile; cannot be cultivated; are inoculated with difficulty (a criminal after five years from the time of an experimental inoculation became a leper). There is no real identity between the lepra and tubercle bacilli.

**Bacillus of bubonic plague** (Fig. 114) is found in the blood of patients affected with this disease. It is small, stains at the ends (looking like diplococci). Has a capsule; the bacillus looks like that of chicken cholera (being a

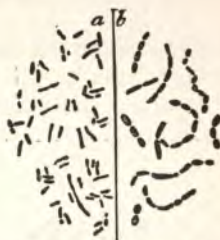


FIG. 114.—*Bacillus pestis*: *a*, Agar culture; *b*, bouillon culture ( $\times 1000$ ).

short, broad bacillus with rounded ends, is non-motile, does not stain with *Gram's method*); on bouillon forms fine dust-cloud; gelatin is not liquefied; on agar-agar, by reflected light, a whitish cloud is formed; it does not form spores.

**Bacillus Aërogenes Capsulatus.**—Gas-forming bacillus; is widely distributed—soil, skin surface, intestine; 3 to 5 mm. in length and about the thickness of the anthrax bacillus; non-motile; it is non-chromogenic, purely anaërobic, and is pathogenic; it is easily cultivated in ordinary media; readily by *Gram's method*; it is probably

identical with the *Bacillus phlegmonis emphysematosæ* (a bacillus which is the common cause of emphysematous gangrene).

**Fungi** (moulds or hyphomycetæ) are long, jointed filaments with spores attached. In general, moulds consist of two parts—(a) the spore (hypha); (b) a network (mycelium). According to the way in which spores are attached to the filaments they are classed as—(1) *Oidium* (chain of spores attached to filament); (2) *mucor* (sac of spores); (3) *aspergillus* (in which there are pairs attached to arms extending out from bulbed filament ends); (4) *penicillium* (a form consisting of chain spores attached to multi-armed filament ends).

## CHAPTER IX.

### WOUNDS; SPECIAL SURGICAL DISEASES.

**Definition.**—A wound is a solution of the continuity of the soft parts.

**Etiology.**—Direct mechanical violence is usually implied as the acute source; microbic action, however, is usually concerned in the continuance.

**Varieties.**—Acute (fresh); chronic (old); with relation to body-surface, open (when skin or mucous membrane is divided proportionately to the tissues beneath); closed or subcutaneous (when there is little or no break in epithelial tissue covering); penetrating (containing but a point of entrance); perforating (having points of entrance and exit). Classified descriptively: Contused (hidden); lacerated (torn); incised (clean cut); punctured (pierced); poisoned (injected with noxious matter), and burned (consumed).

**Description.**—Gunshot wounds may be differentiated into contused, lacerated, punctured, or burned; grazing missile, and brush burns are forms of contused or burned wounds. Burns are due to the reaction of the body to dry heat or flame (lightning-stroke usually presents features of burning); scalds are characterized by absence of injury to hairs covering the part affected; strong acids or alkalis produce the effect of burns rather than of scalds; x-ray burns partake of the nature of a trophic neuritis. Burns have been divided into—(1) Those affecting the skin alone (from the slight inflammatory reaction following a scorch to destruction of the true skin); (2) all others. The two classes may occur at the same time, owing to a different degree of heat at the edge of the agent producing them. Frost-bite, chilblain, pernio (congelation), result from cold, giving rise to an indirect form of wounding. Poisoned wounds are re-



stricted to the condition following the bites of poisonous snakes and animals or contamination with noxious material not micro-organismal in origin (metallic poisoning). *Infected* is a term used indiscriminately when referring to all forms of wounds which have become contaminated by germ life: *septic*, developing pus-organisms; *aseptic*, germ-life insufficient to give rise to local disturbance. Falls and blows from blunt instruments cause subcutaneous wounds and are more or less contused. Sharp implements give rise to open wounds which may be simple stab, punctured, or incised; when more complicated, contused or lacerated. Punctured wounds are usually deeply incised and present some contusion (tooth wounds partaking of the same nature). Contusions follow to a certain extent all wounds, whether open or closed, that are due to blows and are characterized by an area of necrosis varying with the force of the blow (the passage of the sharpest blade through the tissues of the body leaves behind a track of destroyed cells).

**Pathology.**—The pathology of wounds is the pathology of inflammation, which, with the complications arising therefrom, includes the entire field of disease change.

**Symptoms.**—Local: Pain, hemorrhage, loss of function, gaping. Constitutional: Shock, traumatic delirium.

**Complications.**—The local complications are secondary hemorrhage, air in the veins, paralysis, permanent loss of function, hemophilia, bone-fracture, penetration into joints, cranial, thoracic, or peritoneal cavities with hernia or perforation of viscera, edema, tension, germ infection, pus, tetanus, erysipelas, diphtheria, ulceration, cellulitis, abscess, sloughing, gangrene, fistula, keloid, scar contraction, ankylosis, scar-bound nerve filaments, tumor formation (fibroma, gumma, cancer, sarcoma).

**General.**—General shock, septicemia—(a) sapremia or toxemia; (b) septic infection, pyemia, thrombosis and embolism (blood or fat-globule), secondary parenchymatous inflammation of the kidney, heart, liver, lungs, with uremic poisoning, amyloid degeneration of liver, spleen, kidney, and gastrointestinal tract; marasmus, tuberculosis, syphilis.

**Repair.**—Inflammation is so closely associated with both

the pathologic and reconstructive processes that it was impossible, until the discovery of the factor of pus micro-organisms, to make a correct deduction as to when the destructive gave way to the restorative function.

**Phenomena.**—Incised wound (*healing by primary union or first intention* (Fig. 115): (1) There is a period of quiescence, varying from a few moments to a number of hours, with blood stasis in the immediate neighborhood of the wound. The movement of pigment ceases; at the margin

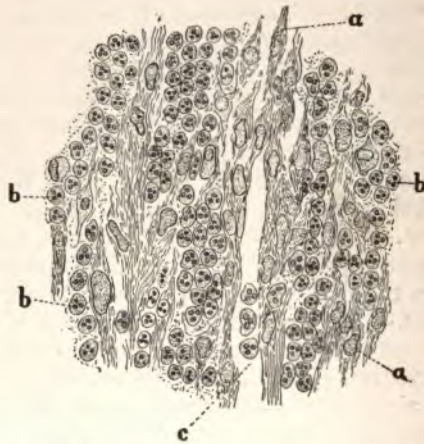


FIG. 115.—Process of repair of a wound: *a*, cells forming connective-tissue; *b*, leukocytes; *c*, newly-formed blood-vessels.

of the stasis blood passes through the capillaries slowly. In the outer area the blood-vessels are dilated and have increased circulation. (2) Exudation of serum (*liquor sanguinis*), with migration and entanglement of the cells (coagulation). The wound surfaces become glued by this (coagulum) lymph covering.

**Organization.**—During the course of the next four to eight days coagulum, made up of blood and lymph, is replaced by new cells (fibrillar connective tissue and blood-vessels) forming the cicatrix (scab or crust is excess of



coagulum under which healing progresses). Skin-formation proceeds from the borders of the wound by proliferation of the cells of the rete Malpighii and sebaceous glands (if present). The cicatrix is first a red line, but gradually becomes white (blanching), due to shrinkage of the new-formed connective tissue and a disappearance of a portion of the vessels. The scar sometimes entirely disappears by this means.

Where loss of substance has occurred (*healing by granulation or secondary intention*) (Fig. 116). For twenty-four hours the tissues may be distinguished; later on, lymph formation and a process of fatty degeneration obscure the outline. The wound spaces become filled with a reddish, yellow



FIG. 116.—Wound healing by granulation.

fluid (blood, serum, and lymph); next there is a cellular infiltration of wandering connective-tissue cells from the wound borders, increasing until the blood coagulum is entirely replaced. By the third day the wound cleft is to be filled up with tissue made up almost entirely of round-cells, a small amount of intermediate substance, and remains of blood coagulum. Later come large epithelioid cells, the forerunners of granulation tissue formation and fibroblasts, which form fibrillar connective tissue (cicatrix). Note that original fixed connective-tissue cells and the endothelium of the vessels are the principal sources of cicatricial formation. (See Fig. 117.)

Nutrient during the progress of healing comes from escaping plasma.

**Vessel formation** progresses with the stages of repair and proceeds from preëxisting vessels by budding.

**Phenomena.**—There is a granular accumulation of protoplasm at some portion of a capillary loop which becomes a solid protoplasmic filament containing a nucleus (Fig. 118). This simple or branched process joins with a neighboring end-sprout or unites with the wall of the capillary from which it sprang. Processes from branching formative cells



FIG. 117.—Loops of blood-vessels in granulation-tissue (Thiersch).



FIG. 118.—Formation of new blood-vessels as seen in the tail of a tadpole (Arnold).

of the intercellular substance may aid in the formation by union with vessel sprouts. The solid interior is tunneled by liquefaction necrosis, excavation meeting excavation from opposite ends, or into an open pouch forming the end of a filament. The walls are at first homogeneous; later they become nucleated, separating into flat cells (endothelium).

**Treatment of Wounds.**—**Indications.**—(1) Avoid infection of wounds by a careful attention to the details of antiseptics and asepsis, as for an operation. Arrest and prevent bleeding by: *Local*: Forceps, angiotribe, ligature (Fig. 119), suture,



torsion (Fig. 120), acupressure, position, pressure (finger, tourniquet (Fig. 121), Esmarch tube, Spanish windlass, packing, dressing, and bandage), heat (hot water, cautery), cold, styptics (thyroid extract, adrenalin, tannin in collodion,



FIG. 119.—Method of controlling hemorrhage by ligation (after Esmarch): *a*, Artery ligated; *b*, lateral ligation of vein.



FIG. 120.—Method of controlling hemorrhage by torsion.

perchlorid of iron, tincture of benzoin), gut-wool, melted paraffin (bone hemorrhage). *General*: Rest, transfusion, drugs (opium, gr.  $\frac{1}{8}$ —0.008 gm.; tinct. digitalis, ℥v-xx—0.333–1.333 c.c.; atropin, gr.  $\frac{1}{150}$ —0.004 gm.; tannic acid,



FIG. 121.—Impromptu tourniquet for compressing an artery with a handkerchief and a stick.

gr. iij-xx—0.199–1.333 gm.; gallic acid, gr. v-xxx—0.333–2.0 gm.; oil of erigeron, ℥v-xx—0.333–1.333 c.c.; ergot, fluid extract, f3j-ij—4–8 c.c.). (2) (*a*) Clean the wound by: the action of accompanying hemorrhage; suction;

apply a ligature above the site and incise; ammonia (poisoned wounds, snake-bites, stings), cautery, submersion of the part

R. Morp. sulph. . . . . gr. ij (0.133 gm.).  
 Ichthylol . . . . . ℥iv (16 gm.).  
 Glycerin . . . . . ℥iv (16 c.c.).

M. Sig.—Apply locally every two hours for insect (spiders' bites).

in water (hot, tepid, or cold), for hours at a time (burns and infected wounds), soap and water (rinsing and mopping dry afterward), turpentine, alcohol, hydrogen dioxid, nitric acid, carbolic acid (pure to 1:500 solution), bichlorid (1:5000 to 1:1000), potassium permanganate (1:100 to 1:2000), clear away dead or badly infected portions with forceps, scissors, curet, by instituting drainage.

R. Terebinthin,  
 Alum . . . . . saturated solution.

M. Apply locally.

R. Alcohol,  
 Alum . . . . . saturated solution.

M. Apply locally.

R. Collodion . . . . . ℥j (32 c.c.).  
 Menthol . . . . . ℥ss-ij (2-8 c.c.).

M. Sig.—Apply t. i. d. to contused wounds ("black-and-blue" spots, when seen early).

(b) Close the wound after securing coaptation of like tissues by means of sutures, adhesive strips (sterile), dusting-powders, gauze and collodion, paraffin, and beeswax (āā), scabbing solution (used at Pennsylvania Hospital), tinct. benzoin and collodion:

(1) R. Gun-cotton (Anthony's negative) . . . . . ℥j (32 c.c.).  
 Alcohol (95 per cent.) . . . . . ℥j (32 c.c.).

Sig.—Shake for ten minutes.

(2) R. Compound fluid extract of benzoin (Shoe-maker's or Bullock & Crenshaw's) . . . . . ℥iij (96 c.c.).

Sig.—Add to (1), let stand for ten minutes, shake a little.

(3) R. Strong sulphuric ether . . . . . ℥xxiv (768 c.c.).

Sig.—Add to the mixture of (1) and (2), shake until clear.

Compress and retention bandage; dressings: gauze (plain sterile, salicylated, iodoform, bichlorid), cotton, rubber tissue.

(3) Rest, splints, slinging, change dressing infrequently unless specially indicated by pain, discharge, pulse, temperature.

**Treatment of Special Forms of Wounds.**—*Sunburn.*—Saturated solution bicarbonate of sodium:

R. Vinegar or dilute acetic acid . . . . . f℥j (32 c.c.).  
 Glycerin . . . . . f℥j (32 c.c.).  
 Bismuth subnitrate, q. s. Add to paste.

Sig.—Apply locally.

*Burns.*—Provisional dressing (waxed paper, rubber tissue held on by means of bandage after clothing of the part has been removed); permanent (clear up the wound of dead tissue by scissors, forceps, and rinsing with hydrogen dioxid—1:5 to full strength, according to amount of pain caused); cover the wound with lapping strips of rubber tissue, fluffed gauze, bandage; change as frequently as called for by the amount of discharge. Continuous bath by submersion of the parts in sterile water or boric acid (1:500 solution at 100° F.—37.6° C.). Subcutaneous saline injection has been recommended in the treatment of extensive burns, to take the place of heat-absorbed moisture from the body.

*Gunshot.*—Treat antiseptically unless hemorrhage demands immediate attention. Unless specially indicated, probing is to be generally avoided (question of amputation or excision arising, pyrexia, suppuration continuing after the first thorough cleansing). Remove gunpowder grains in the skin by frequent applications of gauze saturated with hydrogen dioxid applied early. Operative interference in the case of visceral (gunshot or stab) wounds is provisional upon the presence of serious internal hemorrhage, extravasation, or sepsis. In the case of joints, treatment depends upon the extent of destruction and the rapidity of the infecting process, guided by the surgeon's judgment.

*Impacted missiles* (arrow-heads) or *fish-hooks* are sometimes best removed by forcing a point of exit, thereby providing subsequent drainage opening and causing least amount of laceration.

### SHOCK.

**Definition.**—Constitutional effect of injury.

Collapse (profound shock, general bodily weakness without loss of consciousness); traumatic delirium (cortical dis-



turbance in shock); syncope (fainting, a sudden momentary bodily weakness with partial or complete loss of consciousness).

**Etiology.**—Wound or injury.

**Pathology.**—Unknown. Right heart and large veins are found engorged with blood at autopsy.

**Symptoms.**—Modified by age, sex, mental state, and temperament—(a) Depression (rapid, thready pulse; shallow, rapid, sighing respiration; fall of temperature; pallor, clammy skin); relaxation (muscles, sphincters); mental state (excitement to unconsciousness). (b) Reaction (rise of body-temperature, increase in pulse and respiration, headache, vomiting).

**Treatment.**—Promote reaction by recumbent posture (head low), heat (hot bottles, bricks, blankets), quiet, mustard-plasters to chest and abdomen, transfusion, saline (hypodermoclysis), venesection, dilatation of sphincter ani (acts as a stimulant), drugs (nitroglycerin, gr.  $\frac{1}{100}$ —0.0006 gm.; tinct. digitalis, ℥v—xx—0.333—1.33 c.c.; strychnin, gr.  $\frac{1}{30}$ — $\frac{1}{10}$ —0.0022—0.006 gm.; atropin gr.  $\frac{1}{150}$ — $\frac{1}{100}$ —0.0004—0.004 gm.; amyl nitrite (pearls); opium, gr.  $\frac{1}{8}$ — $\frac{1}{4}$ —0.008—0.016 gm.; whisky or brandy, fʒj—4 c.c.—hypodermically); forced feeding (by mouth and enemata).

**Prognosis.**—If pronounced, serious.

## INFLAMMATION.

**Definition.**—The reaction of a part to an irritant. The reaction of parablasic tissues to the actions of irritants, attended with overfilling of the blood-vessels, changes in the walls, extrusion from them of modified plasma and leukocytes, with proliferation of connective-tissue cells. These changes have in view removal or isolation of the source of irritation.

**Sources.**—(1) Portion of tissue or some abnormal product of metabolism. (2) Micro-organisms. Both act together usually, and when but one is present, it is difficult to distinguish which is acting.

**Morphology.**—Changes—(1) Vascular: (a) Contraction



of blood-vessels, first transient (reflex), which may or may not precede inflammation; velocity of blood-current increased; (b) dilatation, active congestion at the periphery of inflammatory area with stasis at the center (current slowed) (Figs. 122, 123). Capillaries enlarge so as to be distinctly seen; later they become invisible, due to peripheral drift or the tendency of the leukocytes to fall toward the walls of the vessel, and migration. There is leakage of morbid blood plasma, which may coagulate and become lymph.

**Symptoms.**—(1) Redness (hyperemia); (2) heat (hyperemia and chemic change); (3) swelling (blood and exuda-



FIG. 122.—Normal vessels and blood-stream.



FIG. 123.—Dilatation of the vessels in inflammation.

tion); (4) pain (due to new formed products and pressure); (5) loss of function (nerve irritation).

Parablastic: (1) Degenerative; (2) regenerative (multiplication of cells).

Archiblastic: (1) Liquefaction, liquefaction necrosis, or pus-formation (named according to locality as pyothorax, pyopericardium); when upon the surface, it is termed *ulceration*. There are two forms of *ulcers*: (a) Extending; (b) healing. Extending ulcers may be: (a) Serpiginous (serpentine), healing in one place and breaking out in another; (b) diphtheritic (exudate upon the surface undergoes coagulation); (c) gangrenous (when sloughing occurs); (d) fungous (connective tissue fails to build up but forms imperfect

growth); (*e*) indolent (marked induration); (*f*) varicose (due to varicose veins). Suppuration within tissues forms—(2) Diffuse suppuration or purulent edema; (3) coagulation necrosis; (4) regeneration (proliferative changes in connective-tissue cells tending to upbuilding).

**Treatment.**—Indication: Remove the source of irritation; enforced rest (bed, sling, splints, shade); position (elevation); diet (food in small quantities at frequent intervals); venesection, scarification, puncture, cupping, leeches, cold (ice-bag, irrigation coil), heat (fomentations, hot-water immersion), incision, antiseptic poultice (flaxseed well boiled in the making becomes sterile), tincture of iodine, iodid of cadmium (causes only slight yellow staining of the skin), lead-water and laudanum applied upon cloths:

- R. Tinct. opii . . . . . f  $\frac{2}{3}$  ss (16 c.c.)  
 Solution of lead subacetate . . . . . f  $\frac{2}{3}$  ss (16 c.c.).  
 M. Add one pint (512 c.c.) of water for use.
- R. Unguent. belladonnæ . . . . .  $\frac{3}{4}$  j (32 gm.)  
 Unguent. hydrarg. . . . .  $\frac{3}{4}$  j (32 gm.).  
 M. Sig.—Local.

Pressure, massage. Internally: Opium, morphin sulphate, gr.  $\frac{1}{8}$ – $\frac{1}{4}$  (0.008–0.016 gm.); quinin, gr. i–v (0.066–0.333 gm.) t. i. d.; (chronic) counterirritation (cautery, blister).

### SUPPURATION.

**Definition.**—Suppuration consists of a liquefaction necrosis of an inflammatory exudate.

**Morphology.**—(1) Occurring on the surface: (*a*) Ulceration, suppuration on free surface; (*b*) purulent catarrh, on mucous membranes; (*c*) pyothorax, etc., on serous membranes. (2) In tissues: (*a*) Abscess, localized deposit; (*b*) purulent edema (phlegmon), diffuse septic infiltration.

**Etiology.**—Infection by micro-organisms.

### ULCERATION.

**Definition.**—Ulceration is the molecular death of a part.

**Morphology.**—(*a*) Simple or healthy (healing); (*b*) indo-

lent or callous (in which there is little or no attempt at repair); (c) neuralgic, erethistic, irritable (describing sensitive-ness); (d) varicose or hemorrhagic (bleeding or associated with varicose veins); (e) sloughing or phagedenic (eating); specific (syphilis, cancer, diphtheria, tuberculosis, rodent); (f) Marjolin's ulcer (malignant change occurring in indolent ulceration). The line of demarcation between healthy and diseased tissue (floor of an ulcer or wall of an abscess) is known as *pyogenic membrane*.

**Treatment.**—*Local*: Protection; rest; elevation; pressure; strapping (Fig. 124), elastic bandage, multiple incisions (indolent) (Fig. 125); hydrogen dioxid, rubber-tissue strips



FIG. 124.—Strapping of ulcer of leg (after Liston).



FIG. 125.—Incisions for adherent ulcer.

(overlapping); copper sulphate; silver nitrate (to reduce granulations); skin-grafting; curettage, cauterization—Paquelin cautery, nitric acid, acid nitrate of mercury, potassa fusa, arsenic paste:

- |    |  |                      |
|----|--|----------------------|
| R. | Acid. arsenosi . . . . .                                     | gr. xx (1.333 gm.)   |
|    | Hydrarg. sulphuret. . . . .                                  | gr. xl (2.666 gm.)   |
|    | Ung. . . . .   | q. s. f ʒj (32 gm.). |
| M. | Sig.—Apply to limited areas spread on cloth.                 |                      |
| R. | Acid. pyrogallic. . . . .                                    | ʒiv (16 gm.)         |
|    | Cerat. . . . .   | q. s. ʒj (4 gm.).    |
| M. | Local (excision—tuberculous, cancerous, phagedenic, rodent). |                      |
| R. | Balsam of Peru . . . . .                                     | ʒj (4 gm.)           |
|    | Castor oil . . . . .   | f ʒj (32 c.c.).      |
| M. | Sig.—Local use.  |                      |



- R. Unguent. carbolic. ; unguent. borac. ; unguent. ichthyol. ; unguent. zinc.
- R. Liq. plumb. subacetat. . . . . f ʒj (32 c.c.)  
 Liq. carbon. detergens . . . . . f ʒj (32 c.c.)  
 Aqua . . . . . Oj (512 c.c.).
- M. Sig.—Apply as a wash (for eczematous conditions).

*General:* Improve the hygiene, tonics (iron, quinin, strychnin):

- R. Elix. ferri.  
 Elix. quin. . . . . aa f ʒij (64 c.c.).
- M. Sig.—f ʒij (8 c.c.) t. i. d.

### ABSCESS.

**Definition.**—An abscess is a circumscribed collection of pus.

**Morphology.**—Acute (hot); chronic (cold); primary (at the site of original infection); secondary or metastatic (due to emboli of infected material.)

**Etiology.**—Pus micro-organisms (separate or in connection with other forms) with or without trauma.

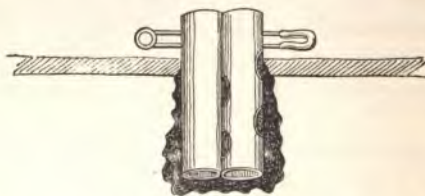


FIG. 126.—Drainage-tubes for abscess requiring irrigation.

**Pathology.**—Owing to interference of circulation from pressure the tendency of an abscess is to reach the surface (pointing). The pyogenic membrane after discharge of an abscess becomes the base for healing (granulation) or regeneration.

**Symptomatology.**—Symptoms of inflammation increasing in severity with fluctuation, pointing, rise of temperature (remittent type).



**Diagnosis.**—Diagnose from aneurysm by history and local signs.

**Treatment.**—Incision at most dependent part, drainage (Fig. 126), irrigation with hot water, boric acid (3 per cent.), hydrogen dioxid (10 per cent. to full strength), carbolic acid (1:500 to full strength; guard after one minute by alcohol), bichlorid (1:3000–1:1000); twist of gauze, gauze and rubber-tissue twist (cigarette), horsehair, catgut twist, rubber or glass tubing.

**Dressing.**—Bichlorid, carbolic, salicylate, sterile (gauze), sling. Secure enforced rest.

**Constitutional.**—Stimulating diet, tonics.

**Prognosis.**—Good for acute, guarded for chronic or secondary.

#### BOIL OR FURUNCLE.

(Dermal Abscess.)

**Treatment.**—To abort: hot fomentation

- R. Ung. hydrarg.  
 Ung. belladonnæ  
 Ung. ichthyol. . . . . aa ʒj (4 gm.).  
 M. Sig.—Local, and make pressure with adhesive straps.

**Internally.**—Tonics (iron, cod-liver oil); calx sulphurat., gr.  $\frac{1}{8}$ – $\frac{1}{2}$  (0.016–0.033 gm.) t. i. d., after eating; acid arsen., gr.  $\frac{1}{30}$  (0.0022 gm.) t. i. d.; yeast, sod. carbonate, gr. v (0.333 gm.), t. i. d.

**Operative Treatment.**—Incision, drainage, elevation of the part affected when possible, frequent hot-water fomentations.

**Prognosis.**—Good for cure in isolated cases. Protracted treatment often required when multiple or consecutive.

#### CARBUNCLE.

**Definition.**—A circumscribed inflammation of the skin and deeper tissues, subsequently breaking down and evacuating through one or more apertures. It is a multiple boil.

**Etiology.**—Inoculation with pus micro-organisms associated with lowered vitality.

**Symptoms.**—Violent inflammation with formation of a vesicle, rapid sloughing, or subcutaneous tissue with evacua-

tion of pus and necrotic masses through multiple openings (most common) through the skin.

**Treatment.**—*Local*: Hot-water fomentations; inject into center 5–20 drops (0.333–1.333 c.c.) of 10 per cent. carbolic-acid solution (to abort); strapping (under general anesthesia); incision (Maltese cross); excision; curettage; cauterization; carbolic acid (pure, followed by alcohol); hot antiseptic poultice; antiseptic dressing; frequent syringing with hydrogen dioxid; open drainage. *General*: Enforced rest, tonics, whisky, forced feeding; opium for pain.

**Prognosis.**—Serious.

### GANGRENE.

**Definition.**—Gangrene is death of a part in mass.

**Morphology.**—(a) Dry or senile (Fig. 127) (caused by arteriosclerosis, embolism); (b) moist (venous congestion, great laceration of soft parts after trauma, burns, cold); (c) true traumatic or spreading (follows crush); (d) idiopathic or spontaneous (symmetric or Raynaud's disease, due probably to vasomotor spasm).



FIG. 127.—Senile gangrene of the feet (Gross).

**Occurs in** extremities, viscera (intestine, lungs).

**Treatment.**—*Local*.—Prevention; elevation, massage, protection from extremes of temperature (cotton-batting envelop for limb); in cases of violent inflammation relieve pressure by incisions; in frost-bite gradual return to normal temperature secured by rubbing part with ice or snow, immersion in iced water; prevent infection of parts by antiseptic dressings.

*Amputation.*—Exceptionally required in senile form; in true traumatic or spreading, early and well above area affected; in other forms, line of separation (demarcation) may usually be allowed to form as a guide for removal.

*Constitutional Treatment.*—Rest, moderate elevation,

forced stimulating feeding (small quantities at frequent intervals), tonics (iron, quinin, strychnin), whisky, brandy.

**Prognosis.**—Guarded.

### BED-SORE.

(Decubitus.)

Occurs after long illness, injury to brain or spinal nerves, pressure upon recumbent parts (buttocks, heels, back). May take the form of chronic ulceration, sloughing, or gangrene. Kills by exhaustion, hemorrhage, involvement of important structures, or pyemia.

**Treatment.**—Preventive; water or hair mattress, soft pillows, strict cleanliness, frequent bathing of skin with alcohol.

*Local Treatment.*—Antiseptic dressing, hot fomentations.

*Constitutional Treatment.*—Tonics (iron, quinin, strychnin); stimulation (food, whisky and brandy); fresh air, sunlight.

### RAYNAUD'S DISEASE.

(Symmetrical Gangrene.)

**Definition.**—Raynaud's disease is a condition characterized by local anemia, congestion or gangrene of tip of nose, ears, fingers, or toes. It may be progressive. Chronic ergot-poisoning gives rise to similar effects (ergotism).

**Treatment.**—Improve the constitution and protect from cold. Electricity has been recommended as a curative measure.

**Prognosis.**—Bad for cure, but generally good for life.

### GANGRENOUS STOMATITIS.

(Cancrum Oris; Noma.)

**Definition.**—Gangrene of the cheek following the eruptive fevers (measles, scarlet fever), usually confined to children.

**Etiology.**—Of bacterial origin.

**Symptoms.**—Commences as an ulcer upon the inner side of the cheek, followed by purulent discharge, slough-



ing, extension to alveolus, and perforation of the cheek, with general exhaustion.

**Complications.**—Inspissation pneumonia, septic diarrhea, septicemia.

**Treatment.**—*Local*: Evert the cheek: excision, curettage, cauterization (Paquelin cautery, nitric acid, acid nitrate of mercury); mouth-wash of hydrogen dioxid; potassium chlorate 30 gr. (2 gm.) to water 1 fl. dr. (4 c.c.); potassium permanganate, 1:1000. *General*: Supportive and stimulative.

**Prognosis.**—Grave. Recovery is followed by great local deformity.

#### NOMA PUDENDA.

**Definition.**—A condition, similar to cancrum oris, affecting the genitals of female children during the course of exhaustive diseases.

**Treatment.**—The same as for cancrum oris.

**Prognosis.**—Unfavorable.

#### HOSPITAL GANGRENE.

(Sloughing Phagedena; Putrid Degeneration.)

**Definition.**—Considered as a contagious gangrenous disease.

**Etiology.**—Micro-organisms (virulent streptococci have been noted).

**Treatment.**—Antiseptic wound treatment has caused this disease to become solely of historic interest. Treatment is preventive by carrying out the rules for surgical cleanliness; active treatment consists of isolation, stimulation, and supportive measures.

**Prognosis.**—Unfavorable.

#### PERFORATING ULCER OF THE FOOT.

Sinus or ulceration upon the sole of the foot of trophic origin (locomotor ataxia).

**Treatment.**—Unsatisfactory and consists of prolonged rest and antiseptic and stimulative measures locally applied.



## INFECTION.

**Definition.**—Local or general signs of germ life in the body.

**Etiology.**—(a) Pus-producers, as streptococci, staphylococci; (b) gonococcus; (c) tetanus bacillus; (d) tubercle bacillus; (e) anthrax bacillus; (f) *Bacillus mallei* (glanders); (g) syphilis (?); (h) actinomyces (ray-fungus); (i) Klebs-Löffler bacillus; (j) plague bacillus.

**Pathology.**—*Local*: Degenerative and regenerative changes. *General*: (1) Mild forms of traumatic fever—primary: (a) aseptic, fibrin ferment fever; (b) true traumatic (sapremia or ptomain poisoning); secondary: (a) acute, pus fever; (b) chronic, hectic fever. (2) Severe—septicemia: (a) in which micro-organisms alone are present; (b) products present (sapremia); (c) true septicemia (micro-organisms and products present). (3) Pyemia (pus in the blood), constituting true septicemia with puriform deposit.

**Symptoms.**—Aseptic (inflammatory) fever; chemic action during healing of aseptic wound causes moderate rise of temperature ( $102.5^{\circ}$  F.— $39.2^{\circ}$  C.) without subjective symptoms. Septic (true traumatic or surgical) fever, remittent type lasting from five to seven days or until suppuration is established. Rapid pulse and respirations, coated tongue, anorexia, constipation, scanty urine.

Suppurative (secondary, mild type of traumatic) fever. Marked or continued signs of fever (chills), diarrhea, body waste, night-sweats, enlarged glands, amyloid change.

Severe form of traumatic (septicemia) fever with symptoms increasing progressively until pyemia (metastatic abscess formation) results.

**Complications and Sequelæ.**—Intercurrent disease: nephritis, pneumonia, tuberculosis; amyloid: adenitis, abscess, sinus, fistula, fissure, ulcer, ankylosis.

**Treatment.**—*Local*: Change dressings, elevation of part; secure free drainage (incision, rubber tubing, gauze, rubber-tissue twist, horsehair); cleanse wound (hydrogen dioxid—1:10 watery solution up to full strength; carbolic-acid solution—1:500 to full strength, controlled with alcohol; bichlorid—1:10000 to 1:1000); hot water—110°

to 130° F. (40.3° to 54.4° C.). *General*: Rest, isolation, frequent feeding (light and stimulating), sunlight, drugs (bromids, 20 gr.-4 dr. (1.333-16 gm.), freely diluted; morphin sulphate,  $\frac{1}{8}$ - $\frac{1}{2}$  gr. (0.008-0.033 gm.); hyoscin hydrobromate,  $\frac{1}{200}$ - $\frac{1}{80}$  gr. (0.0003-0.0008 gm.); chloral, 10 gr. (indicated in traumatic delirium); whisky and brandy, 1-2 fl. dr. (4-8 c.c.) to 2-4 fl. oz. (64-128 c.c.); tincture digitalis, 5-20 min. (0.333-1.333 c.c.); strychnin,  $\frac{1}{30}$ - $\frac{1}{15}$  gr. (0.002-0.004 gm.); atropin,  $\frac{1}{150}$ - $\frac{1}{100}$  gr. (0.0004-0.0006 gm.).

**Prognosis.**—Good for local; guarded for systemic.

### TUBERCULOSIS.

**Definition.**—A disease marked by progressive infection with tubercle bacilli.

**Etiology.**—**Predisposing.**—Heredity (habit); age (twenty to forty); occupation (irritating atmosphere, dust of metals); bad hygiene; lowered resistance from other diseases (typhoid, syphilis). **Exciting.**—Tubercle bacilli.

**Varieties.**—(1) Acute; (2) chronic; (3) fibroid.

**Pathology.**—(a) Deposit of bacilli gives rise to irritation, infiltration, and presence of giant-cells; (b) coagulation necrosis (gray tubercle); (c) liquefaction necrosis (yellow tubercle); (d) puriform mass (action of tubercle bacilli); (e) pus-formation (mixed infection).

**Treatment.**—**Local.**—(A) *Epithelial Tissues* (Lupus).—(a) Lupus vulgaris (face, extremities); (b) lupus exedens (marked ulceration), x-ray, violet ray, radium, cautery (actual), caustic paste:

R. Acid, arsenosi . . . . . gr. xx (1.333 gm.).  
Cannabis indica . . . . . gr. x (0.666 gm.).  
Acaciæ . . . . . q. s.  $\frac{5}{8}$ j (32 gm.).

M. Sig.—Moisten and spread upon a cloth, apply to limited areas.

Cureting, excision, carbolic acid (pure) one to two minutes, follow with alcohol to stop the action of the acid; pyrogalllic acid (1 to 10 per cent.).

(B) *Glandular Tissues* (Scrofula; Struma).—Thorough removal, dissection, curet, free drainage, carbolic acid and alcohol (as above).



(C) *Mouth, Nose, and Throat*.—Cauterization, excision.

(D) *Bone and Connective Tissues* (Cold Abscess; White Swelling; Caries).—Incision, excision, cureting, cauterization, drainage, iodoform emulsion (iodoform 1 part to 10 parts of olive oil), gauze packing, gauze impregnated with pulverized flowers of sulphur.

**General.**—Secure fresh air and sunlight, plenty of sleep and exercise; regulate diet; cod-liver oil, 1 fl. dr.—1 fl. oz. (4–32 c.c.) after meals; creasote, 1–10 min. (0.066–0.666 c.c.) t. i. d. (capsule); Fowler's solution, 2–5 min. (0.133–0.333 c.c.) t. i. d. (increased gradually); ferri citratis, 3–5 gr. (0.199–0.333 gm.) t. i. d.; quinin sulphate, 1–5 gr. (0.066–0.333 gm.) t. i. d.; hypophosphites; strychnin,  $\frac{1}{60}$ – $\frac{1}{30}$  gr. (0.001–0.002 gm.).

**Prognosis.**—Generally unfavorable.

### RACHITIS.

(Rickets.)

**Definition.**—A nutritional disease of early life characterized by deformity of the skeleton (Fig. 128).

**Etiology.**—Congenital (rare), improper feeding, bad hygiene.

**Pathology.**—Deficiency of calcification with increased cell-proliferation of the bones, tendency to amyloid degeneration of liver and spleen.

**Course and Symptoms.**—Bone changes give rise to: (a) *Skull*: thickening, enlarging ("square head"), abnormal thinning with perforations (craniotabes), delayed and irregular dentition, delayed closure of anterior fontanel. (b) *Chest*: flaring outward of scapulæ ("winged"), flattening of the ribs with protrusion of the sternum ("pigeon-breast"), nodular enlargement of sternal ends of ribs and cartilages ("rachitic rosary"), depression at site of ensiform cartilage, curvature of the spine. (c) *Pelvis*: depression of the promontory of the sacrum, causing narrowing. (d) *Extremities*:



FIG. 128.—Congenital rachitis (Smith).

curvature of the long bones of arms and legs with terminal enlargements (see Fig. 128).

*General symptoms* are restlessness, slight fever, sweating of the head at night, tenderness of the body, and anemia.

**Complications.**—Catarrhal affections, convulsions, green-stick fractures, paralysis.

**Treatment.**—Improve hygienic surroundings (fresh air, sunlight), cod-liver oil, lime-salts, phosphorus, iron, breast-feeding (wet-nurse, early), stimulating diet, eggs, milk. *Local:* Retention splints.

**Prognosis.**—Usually favorable.

### ACTINOMYCOSIS.

**Definition.**—An infectious disease occurring in cattle (lumpy jaw), and in man characterized by an unlimited formation of suppurating tumors (Fig. 129).



FIG. 129.—Actinomycosis.

**Etiology.**—Actinomyces (ray-fungus) (Fig. 129).

**Pathology.**—Chronic inflammation with hyperplasia, which subsequently undergoes degeneration (suppuration) with discharge of sulphur-like bodies (pathognomonic).

**Diagnosis.**—Sarcoma: history; age; occupation; absence of sulphur bodies.

**Treatment.**—*Early:* Excision, cauterization; internally, potassium iodid (pushed to iodism), stimulation. *Late:* Supportive.

**Prognosis.**—Early, good; late, grave.



## GLANDERS.

(Farcy; Equinia.)

**Definition.**—A contagious suppurative disease of lower animals principally (cattle are immune); transmissible to man.

**Etiology.**—*Bacillus mallei*.

**Pathology.**—Progressive degenerative inflammation of the tissues affected, with outpouring of pus and formation of phagedenic ulcers.

**Symptomatology.**—Rapid infection (acute form), local and general; in chronic form suppurating lesions develop slowly over a course of several months.

**Diagnosis.**—From other forms of infection by history and presence of specific micro-organism.

**Treatment.**—*Preventive*: Destruction and burning of infected animals. *Local*: Excision, cauterization. *General*: Stimulative and supportive.

**Prognosis.**—Fatal in acute form; guardedly grave in chronic.

## LEPROSY.

(Lepra.)

**Definition.**—A chronic disease caused by the lepra bacillus, characterized by tubercular formations, ulcers, atrophy, pigmentation, disturbed sensation.

**Etiology.**—The disease is caused by the lepra bacillus.

**Morphology.**—Leprosy is a wide-spread disease, being found in all parts of the world (is more frequent in eastern countries and certain islands of the Pacific Ocean). The disease is contagious (less so than is tuberculosis); caused by heredity sometimes. There are two varieties: (a) Tubercular (made up of vascular and fibrous nodes); (b) anesthetic. The two forms are interchangeable. Ulceration results from external injury (due to anesthetic patches) and from lowered vitality.

**Symptoms.**—Patches of the disease occur first upon the face, extensor surfaces of the elbows, knees; later lymphatic glands are involved; lastly the internal organs. The disease is essentially chronic in nature, and begins with numbness in

the parts to be affected, malaise, headache, chilliness, depression.

**Treatment.**—In some countries isolation is required. Improve the hygiene; tonics. Chaulmoogra oil and gurgun oil externally and internally. Dress the ulcers with ichthyol, resorcin ointment, antiseptics. A fluid extract of mudar (*Calotropis gigantea*) made up with lanolin has proved curative in extensive chronic ulceration of leprous character.

**Prognosis.**—Unfavorable for cure, though the patients may live for many years.

### MYCETOMA.

(Madura Foot.)

**Definition.**—A painless affection of the ball of the great toes and pads of fingers and toes, characterized by nodular formation which undergoes degeneration, with purulent discharge containing black ("gun-powder") and pink ("shad-roe") particles.

Disease occurs in the East Indies, is non-inoculable in animals, but conveyed to man by scratch-wounds.

**Etiology.**—A true branched streptothrix.

**Pathology and Symptomatology.**—Nodules develop at site of infection during the course of two or three weeks, with induration and thickening of the surrounding skin. After months or years breaking down occurs and the healthy tissues, which have become highly vascular, separate from the diseased. Disability occurs solely from deformity.

**Treatment.**—*Local:* Incision, curettage, cauterization, with antiseptic dressing. *General:* Stimulative, supportive.

**Prognosis.**—Good for life, but unfavorable for cure.

### ANTHRAX.

(Malignant Carbuncle; Malignant Pustule; Charbon; Miltbrand; Wood-sore's Disease.)

**Definition.**—An acute infection characterized by localized pustule formation with secondary systemic intoxication, caused by the anthrax bacillus.

**Pathology.**—Formation of a papule and vesicle which, bursting, show an area undergoing degeneration with purulent discharge. New pustules develop about the edge of the primary lesion, and general infection takes place from thrombosis and embolism in capillaries and lymphatics.

**Symptoms.**—Rapidly developing pustule (few hours to three or four days) at the site of entrance wound. Lesions may develop primarily along the gastro-intestinal tract. Moderate pain is felt, and the diagnosis of the disease rests upon the history and the discovery of the anthrax bacilli in the discharge.

**Treatment.**—Incision, excision, cauterization, injection (1 : 10 carbolic-acid solution), application externally of strong solutions of surgical antiseptics.

*Constitutional Treatment.*—Stimulative, tonic, and supportive.

**Prognosis.**—Generally unfavorable.

## TETANUS.

(Lock-jaw.)

**Definition.**—An acute infectious disease giving rise to tonic muscular spasms.

**Etiology.**—Tetanus bacillus; idiopathic in the tropics. In temperate regions wounds are the points of entry.

**Pathology.**—Congestion of the nervous system.

**Symptoms.**—Due to an elaborated poison. Come on after a period of a few hours to three weeks. First symptom is stiff neck, with rapid involvement of throat and jaw muscles (lock-jaw); back and chest muscles contract, giving rise to arching of the spine (opisthotonos). Involvement of the belly muscles in a similar manner causes doubling (emprosthotonos). "Trismus" is used to describe mild attacks of tetanus in which muscular contraction is confined to the neck and face. There is usually absence of fever until just before death, when hyperpyrexia occurs.

**Treatment.**—*Local*: Antiseptic treatment. Incision with free drainage. As a prophylactic measure it has been recommended to inject hydrogen dioxid or formalin solution into



the depths of the wound suspected to be infected with tetanus bacilli. It is claimed, however, that, regarding the use of hydrogen dioxid, oxygen is not set free in sufficient quantity to destroy the tetanus germs. Tetanus antitoxin has been injected into the ventricles, the spinal canal, and into the infected wound as preventive treatment with varying success. *General*: Antitoxin, morphin for pain. Give chloral, bromids, and chloroform inhalation for spasms.

**Prognosis.**—Guardedly unfavorable for acute, guarded for chronic, forms.

### RHINOSCLEROMA.

(Pound Nose.)

**Definition.**—A localized infection due to a micro-organism characterized by hypertrophy of the nose.

**Etiology.**—Predisposing cause, central Europe (Germans, Austrians particularly, liable to the affection). Active cause, a specific organism resembling the pneumobacillus of Friedländer.

**Course and Treatment.**—The disease commences in the lining mucous membrane of the nose, with gradual and progressive enlargement. Amputation is followed by new development. Electricity has been suggested. Correct hygiene is to be secured.

**Prognosis.**—For cure, unfavorable.

### ERYSIPELAS.

(St. Anthony's Fire.)

**Definition.**—An acute contagious disease due to the action of a ~~specific~~ streptococcus and characterized by a peculiar inflammation of the skin and subcutaneous tissue, irregular fever, and a tendency to relapse.

**Etiology.**—Predisposing causes: Lowered vitality, exposure to cold and wet, wound or abrasion. Exciting cause: Streptococcus pyogenes erysipelatis.

**Morphology.**—Idiopathic and traumatic forms have been described, but the two are identical, infection gaining



entrance in the former through a scratch or minute wound of the skin or mucous surface.

**Pathology.**—The part is bright red, swollen, indurated, and circumscribed, with a tendency to spread. Infiltration with serum, lymph, or pus containing the organism occurs.

**Symptomatology.**—After a period of three to seven days, during which the patient complains of malaise, rigors, tingling, or itchiness of the part affected, with enlargement of neighboring lymphatics. Sometimes disease ushered in with chill or vomiting, headache, high, irregular fever, reaching 104° F. in twenty-four hours. Pulse rapid and full, respirations increased, coated tongue, anorexia, constipation, scanty, high-colored urine.

Affected part (face common site) shows tense, glazed, infiltrated area with sharply defined edge. Inflammation is violent; edema of surrounding parts takes place. Inflammation subsides, with desquamation, during the course of a week, with fall of fever by crisis. Relapse, however, is common. Sometimes the disease disappears in one place to reappear in another (erysipelas ambulans). *Schuttz*

**Treatment.**—Isolation. *Local:* Antiseptic dressings (bichlorid 1:2000; carbolic—1:500—gauze), nitrate of silver, 20 to 40 per cent., zinc oxid. Caustic soda (outline area to limit progress). *General:* Stimulative, supportive.

**Prognosis.**—Guarded.

## HYDROPHOBIA.

(Rabies; Lyssa.)

**Definition.**—An acute, infectious febrile disease caused by inoculation in man of a specific virus from an animal suffering with rabies.

**Etiology.**—Due to an organism probably, but has not been isolated.

**Pathology.**—Congestion of medulla and spinal cord.

**Course.**—Incubation six weeks to five months after inoculation (by bite of a rabid animal), in which there are no symptoms; then the previously healed wound reddens, may suppurate a little, great fear comes over the patient,

followed by excitement, convulsion (clonic), moderate fever, death by cramp, asphyxia, or exhaustion.

**Treatment.**—*Preventive*: Cauterization (Paquelin, nitric acid), Pasteur inoculation of graded immunized emulsions of dried spinal cords of rabbits infected with rabies. *General*: Supportive, morphin, chloroform inhalation for convulsions. Rectal alimentation or feeding may be carried on through stomach-tube or catheter passed through the nose.

**Prognosis.**—Hopeless.

### SCURVY.

(*Scorbutus.*)

**Definition.**—A constitutional disease due to absence in the diet of sufficient fresh vegetables, and characterized by nutritional disturbance with tendency to tissue hemorrhage.

**Etiology.**—Lack of fresh vegetables associated with bad hygiene.

**Pathology.**—Fatty degeneration with ecchymoses throughout the viscera.

**Course.**—Weakness, dyspepsia, anemia, spongy gums, hemorrhage from skin and mucous membrane, induration of muscles.

**Treatment.**—Fresh green vegetables (onions), lime-juice, lemon-juice, iron, quinin, strychnin. Locally apply nitrate of silver (20 to 30 per cent.) or potassium chlorate (10 per cent.) to gums.

**Prognosis.**—Favorable in early stages.

### HEMOPHILIA.

(Hemorrhagic Diathesis; Bleeder's Disease.)

**Definition.**—A condition of body manifested by profuse bleeding from spontaneous cause or after slight wounds.

**Etiology.**—Hereditary influence transmitted by female ancestry, but manifested in the males of the descendants.

**Pathology.**—Defective contractility of vessel-walls.

**Symptoms.**—Persistent bleeding after slight wounding

or spontaneously from mucous membrane (nose, rectum); inflammatory condition of the joints and lungs.

**Treatment.**—Active hydragogue catharsis; fluid extract of ergot, 1–2 fl. dr. (4–8 c.c.); oil of erigeron, 5 min. (0.333 c.c.); thyroid extract, 5 gr. (0.333 gm.) t. i. d.; calcium chlorid, 5 gr. (0.333 gm.) t. i. d.; styptics; packing; ice compress.

**Prognosis.**—Grave. The individual seldom reaches maturity.

## CHAPTER X.

### **PATHOLOGY.**

**Definition.**—The science of disease.

Pathology includes the study of biology. Biology (the science of life) is divided into—(A) Embryology (generation); Ontology (generation of individual organisms), phylogeny (race generation); (B) Morphology (form): (a) General morphology (treats of the elementary tissues—histology); (b) special morphology (treats of the parts and organs—anatomy); (C) Physiology (the study of functions).

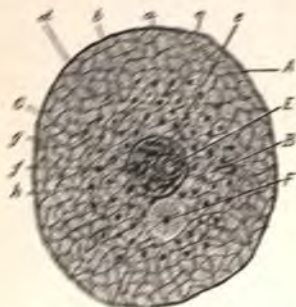
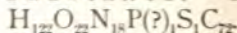


FIG. 130.—Diagram of a typical cell: A, Cell-wall; B, cell-body; C, nucleus; E, nucleolus; F, centrosome; a, spongioplasm; b, hyaloplasm; c, metaplasm or microsomes; d, exoplasm; e, nuclear membrane; f, nuclear network or chromatin filaments; g, nuclear matrix; h, nodal enlargements or net knots (Lorry).

### **CELLS.**

**Definition.**—A cell is a speck of protoplasm—the smallest mass of living matter; is endowed with life, capable of nourishing, growing, and multiplying (Fig. 130). Protoplasm (the physical basis of life) is a colorless, transparent, jelly-like, homogeneous, structureless substance. Formula:



A cell (may exist without a cell-wall) is composed of—(A) Spongioplasm (protoplasmic mass, highly elastic); (B) hyaloplasm (connective network having less power of contraction): contains—a cell-body (granular appearance is due to a filamentary mass (mitom) and a meshwork surrounding (plasma): (a) Nucleus (granular appearance is due to reticulation); its



functions are reproduction and direction over growth and nutrition; (*b*) nucleolus (sometimes present), a spot within the nucleus; (*c*) vacuo (sometimes present), a space within the cell-body which contains a finer fluid than in the main portion (in reality is a primitive heart); (*d*) paranucleus (not constant), is an extrusion from the nucleus; (*e*) centrosome or pole corpuscle, is the pole center of the cell; (*f*) attraction sphere, the foci of formative force about the centrosome.

Cell matter is composed chemically of various albuminous substances, a special nitrogenous proteid (plastin), water, salts, hydrocarbons (fats, etc., in the nucleus). The substance of the nucleus is made up of a reticulum (network) and fluid (plasma or nuclear matrix). Plasma found in the nucleus is called karyoplasma; when found in the body of the filamentary mass it is called cytomitoma or cytoplasma. Reticulum of the nucleus is called karyomitoma. The nucleus is bounded by the nuclear membrane and is traversed by an irregular arrangement (reticulum) of nuclear filaments, some (chromatin) taking stains, and others (achromatin) remaining unstained. The nucleus consists of chromatin.

#### EMBRYOLOGY.

**Definition.**—Embryology treats of the changes taking place in an organism during its growth from a germ to maturity. Organisms are: (1) Protozoa (unicellular), made up of an outer covering (ectosarc) and inside (endosarc); example, the ameba; (2) metazoa (multicellular, develop from eggs—ova); (3) catalacta (compound); example, megasphera or flimmer-ball.

**Propagation.**—By (*a*) fission (division into two similar parts), direct division (uncommon); example, white blood-corpuscles; indirect division (usual method) with karyokinesis (the complicated cycle by which the nucleus is changed precedes indirect division), or mitosis; example, growth of ovum; (*b*) gemmation (budding), outgrowths which later separate, becoming mature; example, hydra; (*c*) spore formation, breaking up of the organism into one or more

seeds; example, tetanus bacillus; (*d*) union of male and female elements (fusion of two dissimilar organisms); example, spermatozoön and ovum (metazoa).

**Development.**—The human ovum ( $\frac{1}{240}$  to  $\frac{1}{120}$  of an inch—about 0.2 mm.—in diameter) is a unicell (protoplasm or blastema) made up of a transparent envelop (zona pellucida or vitelline membrane), and the yolk (germinal matter, bio-plasm, vitellus); within the yolk is the nucleus (germinal vesicle, vesicle of Purkinje); within the nucleus is the nucleolus (macula germinativa; germinal spot of Wagner).

Growth after impregnation consists in segmentation (cleavage) and differentiation (an unknown power whereby appar-

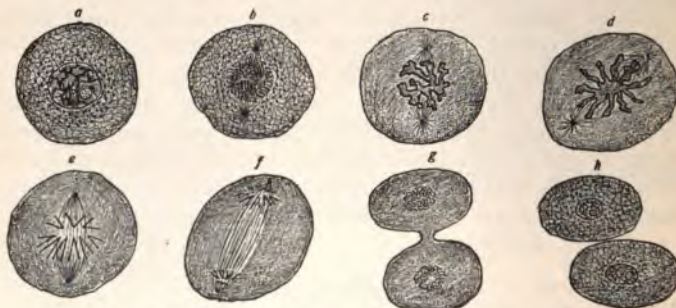


FIG. 131.—Diagram of stages of karyokinesis: *a*, Resting stage; *b*, close skein stage; *c*, *d*, loose skein or wreath stage; *e*, monaster stage; *f*, diaster stage; *g*, showing constriction of cell-body and two nuclei in loose skein; *h*, cell divided completely, nuclei in resting stage (Leroy).

ently identical cells take different forms). Nucleolus and cell-wall disappear at the outset of cell-division.

Segmentation, or karyokinesis or mitosis (Fig. 131) (the completed change to form two cells requires but fifteen to twenty minutes), continues until the large number of new cells form a sphere (mulberry stage or morula) made up of two layers of cells (blastodermic membrane), the outer layer called epiblast, inner layer, hypoblast. Flattening of the blastodermic membrane forms the germinal disc or area, with the first trace of embryo manifested (primitive streak or trace). The germinal disc divides into three layers (gastrula): (A) Epiblast or ectoderm (ex-



ternal layer) forms epithelium (eye, ear, nose, mouth, anus, vagina), skin, glandular appendages (sweat, sebaceous, salivary), hair (arrectores pili muscles), nails, enamel of teeth, nervous system; function, irritability and automaticity. (B) Mesoblast or mesoderm (middle layer, derived from the other two) forms connective tissues (bone, tendon, cartilage, areolar tissue, teeth dentin), circulatory and lymphatic systems, genito-urinary organs (except bladder), muscles (except arrectores pili); functions, reproduction and contractility. (C) Hypoblast or entoderm (internal layer) forms digestive and respiratory systems; function, metabolism. Growth continues by the primitive trace being replaced by the medullary folds or canal (called also notochord, chorda dorsalis), the future spinal column and canal (by segmentation into somites or provertebra). Monstrosities are formed by malformation beginning at the time the medullary folds are first laid down.

### HISTOLOGY.

**Definition.**—Histology is the science which treats of the structural elements of tissues.

Tissues are divided into: (A) Parablastic tissues, those concerned in the nutrition of an organism, carriers of nutriment (blood is the best example), scaffolding for other tissues. (B) Archiblastic tissues, having special functions; example, the secretive cells in the liver. The animal body is divided into four elementary tissues: (1) Epithelial; (2) connective; (3) muscular; (4) nervous; each further divisible into—(a) cells; (b) intercellular substance.

Cells are classified according to form: round, polyhedral, cylindric, pyramidal, spindle, and two forms of flat, tessellated, and squamous stellate cells.

The characteristics distinguishing the structural units of living organisms from those of the inorganic world are: (1) Animal: (a) Irritability (the property by which external influences are responded to by change within the cell); (b) motion (a characteristic of all animal cells, consisting of activity within the protoplasm; may be ameboid or muscular); (2) vegetative: (a) metabolism, the process by which nutrition

is accomplished by changing and absorbing surrounding food-particles; (*b*) growth (in consequence of metabolism parts specialize or the whole develops equally); (*c*) reproduction (formation of new cells).

### GENERAL PATHOLOGY.

The body is constantly undergoing change in structure and organism.

### DISEASE.

**Definition.**—Disease is the imperfect coördination of forces and the changes in structure occurring in a living being when attempting to adapt itself to deleterious agencies.

Diseases are classified in various ways, alphabetic classification being the simplest. According to *synoptic classification* diseases are divided into: Acute (of rapid course), subacute (intermediate), chronic (of long duration with no clear course of termination), local and general. Local may become general through the circulation (metastases); may extend from one organ to another by—(*a*) continuity (along the same kind of tissue); (*b*) contiguity (extension to tissue different from that of primary tissue).

*Intoxication* is a general condition due to minor microbes forming poisons which are carried by the circulation to other tissues (poisoning).

*Cachexia* is a general disorder, a well-marked breaking-down that may be distinctly traced to some local or general disease.

*Diathesis* is a more or less apparent condition of the body which predisposes to certain diseases, and may be inherited or acquired.

*Atavism* is the phenomenon shown when a disease skips a generation.

*Sclerotic* or *cirrhotic disease* implies the circulation of a systemic poison (as in syphilis, tuberculosis, alcoholism).

General diseases may be divided into: (A) Infectious (due to some disease-producing microbe introduced into the body); (B) intoxications (toxemias).

Unclassified diseases are those in which, with a general



disturbance of health, there is a marked tendency to localization in certain tissues.

*Dyscrasia* is a condition in which the blood is changed.

**Etiologic system of disease classification** (according to causation): (1) Infectious; (2) traumatic (due to injury); (3) idiopathic (primary), in which disease manifestations constitute the disease itself; (4) symptomatic (secondary); (5) autogenic (arising within the body); (6) exogenetic (arising from without the body).

**Symptomatic classification** (according to symptoms), as fevers, dropsies, hemorrhages.

**Anatomic or topographic** (surgical classification), according to the location in the body.

**Anatomic and physiologic classification** of disease (according to system affected), as diseases of the nervous system.

Disease which is hidden is called *latent* or *larval*. We have no disease without change of—(1) Function; (2) structure.

**Morbid physiology** is divided into: (1) Pathogenesis (the study of functional disturbances causing structural changes); (2) symptomatology (the study of functional disturbances which follow structural changes). Secondary functional disturbances are symptoms: these give rise to two arts—(A) Diagnosis (the application of a knowledge of symptoms to the practical question of what a disease is); (B) prognosis (the application of a knowledge of symptoms to the practical question of how a disease will terminate).

Symptoms are—(1) Subjective (those signs of disease felt by the patient himself); (2) objective or seen (those determined by the physician); (3) pathognomonic (pointing to a certain disease).

A diagnosis may be: (a) Topographic (by which we decide upon the location of the disease); (b) nosologic (by which we determine the nature of the morbid process); (c) physical (the application of the aided senses, sight (inspection), mensuration (modified inspection), touch (palpation), hearing (percussion and auscultation); (d) diagnosis by exclusion (formed by first putting aside what the disease is not).

According to prognosis or duration diseases are: (a) M (light or ephemeral; benignant); (b) malignant (severe terminating fatally).

**Courses of Disease.**—If symptoms follow regular the disease is *regular* (acute diseases usually in this class if the symptoms do not follow in regular order, the disease is said to be *irregular*).

**Infection.**—The time when the disease first enters the body.

**Incubation.**—The period when micro-organisms are developing but no symptoms are apparent.

**Prodromes.**—The first, uncertain symptoms; same for all diseases (ennui).

**Fastigium.**—The symptoms have reached the height of development.

**Amphibolic Stage.**—Symptoms show that a change is about to take place.

**Decline.**—Symptoms decrease and disappear.

According to the order in which symptoms follow they have *types*. Fevers divided according to types: (1) *intermittent* (has periods of entire absence of fever); (2) *remittent* (no complete intermission, but an abatement of symptoms for a few hours once a day); (3) *continued* (present without intermission); (4) *relapsing* (paroxysms every five to seven days with a strong tendency to recur every seven to fourteen days). No fever occurs in chronic inflammation unless it is septic. When in the course of an inflammation the temperature runs up, a new inflammation has opened. When the temperature suddenly falls in an inflammation, a rupture has occurred in a viscus or organ.

*Pyrexia*, fever. *Hyperpyrexia*, fever above 104° F. *Apyrexia*, absence of fever. *Defervescence*, fall of temperature. *Crisis*, a rapid fall of temperature after fever. *Exacerbation*, gradual decline of temperature after fever. *Exacerbation*, rise of temperature or increase of symptoms. *Relapse*, a few days when change starts or takes place. A disease terminates in: (1) Cure or recovery; (2) death; (3) sequel (remaining complicati



## SIGNS OF DEATH.

Death is due to inhibition of—(1) Respiration (most frequent)—asphyxia; (2) circulation (common cause in fever)—asthenia—arrest of heart's action may be due to organic change or nervous inhibition—syncope; when on account of blood-vessels, shock or collapse; (3) nerve-centers; usually secondary to other forms, may give rise to either asphyxia or syncope.

Prolonged dying is known as agony or agonic death.

**Signs.**—(a) Noting arrest of respiration: polished looking-glass held over mouth remains unclouded; no motion imparted to a vessel of water balanced upon the chest of the body; (b) in suspected death by asthenia produce a blister by match-flame (dry, if dead; contains red fluid if life is present); ligature around the finger will cause congestion below if life be present; a polished needle will tarnish in ten or twelve hours in a living body; translucency around the edges of the fingers is lost within a few hours after death; (c) putrefaction: abdomen becomes mottled, then greenish (abdominal viscera being the first to decay, except the uterus). Decomposition takes place more rapidly when death results from wasting diseases or poisonous conditions of the blood. Decay varies according to the surrounding temperature (is more rapid in high, moist atmosphere than in dry; slowest under ground—below bacterial zone; sooner in summer than in winter; depends also upon locality); (d) If the body-temperature falls below 60° F. (15.5° C.) or if the body-temperature falls to the temperature of surrounding atmosphere within twenty-four hours (body-temperature is raised for a time after death in cholera and in tetanus); (e) cadaveric lividity—discoloration due to the blood flowing to the least compressed portions of the body after death (distinguish from antemortem bruising by incision, a bruise being a clot); (f) cadaveric rigidity (rigor mortis)—hardening of the muscles without contraction (previous to this there is relaxation of the sphincters) comes on ten to fifteen hours after death; in prolonged disease if it takes longer to come, lasts a shorter time.

Diseases followed by apparent death or those in which apparent death may take place: Cholera, hysteria, epilepsy, tetanus, shock, hemorrhage, poison (by gas), hanging, lightning-stroke, heat, alcoholism, narcotics.

**Disease causes** are—(1) Predisposing, those which prepare an individual for an attack; (2) immediate (direct or exciting). Predisposing may be—(a) general (acting upon a whole community); (b) individual (personal), as age, sex, occupation.

*Diseases may be* infectious (capable of transmission from a sick person to a well one); contagious (those directly transmissible): (a) Belonging to man alone, as gonorrhea or syphilis; (b) requiring general predisposing causes, as cerebrospinal meningitis; (c) requiring special diseases of the medium, as typhoid fever or cholera; (d) occurring in man chiefly, but may be carried in animals by inoculation, as tuberculosis, erysipelas, suppuration; (e) originating in lower animals, but may be transmitted to man, as glanders, anthrax, hydrophobia.

#### HYPERTROPHY.

**Definition.**—Hypertrophy is an excess of the growth and nutrition of a part or parts without radical change in the structure of the organ.

It may be—(1) General hypertrophy, when several parts or the whole body enlarges; (2) Local hypertrophy, enlargement of but a single organ: (a) True hypertrophy (functional or compensating to make up for wasting in some other part); (b) false hypertrophy (pseudohypertrophy): but one tissue (connective) is affected.

**Morphology.**—Increase takes place either by—(a) an increase in size of cells (*simple*); or (b) an increase in number of cells (*numerical*); also called hyperplasia (then implies new tissue formation).

**Etiology.**—(a) Removal of pressure; (b) irritation; (c) congenital; (d) excessive functional demands.

Hypertrophy, when excessive, is usually followed by degeneration caused by insufficient blood-supply, though pathologic processes have in them properties capable of causing their extinction.



**ATROPHY.**

**Definition.**—Atrophy is a diminution in the bulk of one or more of the parts of an organ.

**Morphology.**—May be—(a) Simple atrophy (a gradual diminution in the cell without change in the protoplasm); (b) degenerative atrophy (cells are carried away as a fatty emulsion generally).

**Etiology.**—The cells cannot make use of the nutrition which is brought or else not enough is brought. (a) Senile (pathologic if coming on early in life); (b) pressure; (c) disuse; (d) deficient nutrition; (e) neuropathic.

Atrophy of an organ is due to arrested growth of the organism, called hypoplasia (the organ never reaches the normal size); absence of an organ, called aplasia or agenesis. Brown atrophy is a shrinkage with deposit of bile or blood-pigment. A general wasting of the body is designated by the term emaciation. Occurs in gastro-intestinal diseases, diabetes, kidney disease, new growths (sarcoma).

**INFILTRATION.**

**Definition.**—A retrograde change in the cells of a part with impairment of function and a tendency for removal of the cells to take place.



FIG. 132.—Fatty infiltration of the liver. Large fat-globules occupy the liver-cells and crowd the vessels to one side ( $\times 125$ ) (Hektoen).

**Morphology.**—(1) Fatty infiltration (accumulation of fat or oil within the cell-body) (Fig. 132); (2) calcareous in-

filtration (deposition of lime salts within the cells); (3) serous infiltration (dropsy, infiltration of the tissues with diluted lymph); (4) pigmentary infiltration (deposit of blood, bile, or melanin coloring-matter within the cells; dust, bacteria, metals,—silver, lead, mercury,—may also cause it); (5) glyco-genic infiltration (due to deposit of glycogen within the cells).

### DEGENERATION.

**Definition.**—A more complete process than infiltration; cell substance is destroyed, being replaced by abnormal material.

**Morphology.**—(1) Hyaline degeneration (vitreous change, affects connective tissue, walls of blood-vessels, substance deposited looking like "clear glass," similar to amyloid substance, but acts differently with iodine); (2) mucoid degeneration (myxomatous degeneration gives rise to a ropy substance in epithelial-lined cavities and in intercellular substance of connective tissue; mucin is present; example, myxomatous polyp of the nose); (3) amyloid degeneration (development of a substance in the connective tissues of the part affected, giving rise to amyloid reaction with iodine); (4) colloid degeneration (formation of a gelatinous substance resembling mucus (no reaction for mucin) in epithelial cells; example, colloid material from an ovarian cyst); (5) parenchymatous degeneration (cloudy swelling: a change in the protoplasm of epithelial cells by which soluble proteids are precipitated as granules within the cell); (6) fatty degeneration (fat change).

### NECROSIS.

**Definition.**—Death of a part. (a) True necrosis (death of a large number of cells); (b) necrobiosis (gradual death in irregular areas).

**Morphology.**—(1) Coagulation necrosis (formation of fibrin in the tissues; example, diphtheritic membrane); (2) liquefaction necrosis (the plasma of the tissue juices instead of coagulating forms a liquid; example, a blister); (3) cheesy necrosis (caseous necrosis; coagulation of cell-body and intercellular substance, but without formation of fibrin,

differs also from fibrin—formed slower, is denser, dryer, but has the same color); two forms—(A) dry; (B) moist (a last stage of fatty degeneration and liquefaction necrosis; example, tuberculosis); (4) gangrene (a putrefactive fermentation of dead cells attached to the body): (A) Dry (mummification, due to evaporation of water from a part, absence of blood, embolism, removal of skin); (B) moist (due to obstruction of the venous circulation or outflow of the affected part; parts enlarged, swollen, juicy, dark or black in color, gas-formation, crepitation). The whole process is really an oxidation of the part. Emphysematous gangrene, gaseous gangrene, is a form of moist gangrene which has become infected with the—(a) *Bacillus phlegmonæ Emphysematosæ*; (b) *Bacillus aerogenes capsulatus*; (c) *Bacillus coli communis*. The condition is usually followed by death, the internal organs, particularly the liver and spleen, becoming spongy from gas-distention. The disease resembles somewhat malignant edema.

**Etiology.**—(1) Traumatic (due to injury); (2) spontaneous (cause within the body, as diabetes mellitus).

**Surgically Considered.**—Abrasion (death of the cuticle, leaving a raw surface); ulceration (molecular death of a part); gangrene; mortification (death *en masse*); sphacelus (gangrene confined to soft parts); necrosis (death of bone).

### HEMORRHAGE.

**Definition.**—(1) Per rexin (from injury to vessels): (a) Primary (occurs at time of injury); (b) intermediate (before twenty hours or after reaction); (c) secondary (after twenty hours). (2) Diapedesis (slow leakage through the walls). Hemorrhage may occur from—(1) Arteries (spurts, light-red, controlled by proximal pressure); (2) veins (no spurt, dark color, controlled by pressure on distal end); (3) capillaries (oozing); (4) parenchymatous (from erectile tissue). May come from free surface or in tissues; be (a) external (as nose-bleed); (b) internal (concealed, as hemothorax).

**Etiology.**—(1) Traumatic (direct injury); (2) essential



(excess of blood-pressure); (3) vicarious menstruation; (4) hemophilia.

**Terminations.**—External, stops by contraction and retraction of vessel-walls, with coagulation and organization (thrombosis (Fig. 126) takes place, ending in the formation of fibrous tissue); internal (interstitial, absorbed or cyst formed). In serous cavities blood readily absorbed without inflammation.

### LOCAL HYPEREMIA.

**Definition.**—Congestion or increased flow of blood to a part. In the stomach (digestion) such an increase is normal, but it may become pathologic if excessive.

**Morphology.**—(1) Active (the parts become red, swollen, the temperature increases (manifested by heat and pain felt by the patient), disappears after death (due to elasticity and gravity removing all traces); may be (a) idiopathic (due to loss of resisting power in the vessel-walls (arteries) of the part from blows, heat, drugs, nervous action causing paralysis of vasodilators and vasoconstrictors); (b) collateral (caused by obstruction of neighboring regions). (2) Passive (stasis, blood cannot get out of a part—venous obstruction).

**Sequelæ.**—Active hyperemia may terminate in hypertrophy; passive, in cloudy swelling or atrophy (cyanic form especially).

### LOCAL ANEMIA.

(Ischemia.)

**Definition.**—Decrease or absence of blood in a part.

**Etiology.**—(a) Pressure upon vessels going to a part; (b) thrombosis (coagulation of blood at the part); (c) embolism (obstruction elsewhere with portion of clot (embolus) lodged in the vessel where found).

Infarct is wedge-shaped area of blood infiltration due to thrombus or embolism in the artery to the part.



## CHAPTER XI.

### MEDICOLEGAL EXAMINATIONS.

#### AUTOPSY.

**Definition.**—The examination of a corpse to determine the cause of death ; a postmortem examination.

**Implements.**—Blunt-pointed scissors, probe, blow-pipe, injector, tape-measure (metric scale), hammer having a hook handle, postmortem knife (blunt-pointed), enterotome (a large pair of scissors having one blunt point), osteotome, chisel, saw, pail, large sponge, sail needle, wax and ball of string, two small jars, rubber gloves, sleeves, and apron. The essential instruments for an emergency case are : knife, chisel, hammer, saw, sail needle.

**Order of Examination.**—(A) **External.**—An assistant should make written notes at the time of the examination after the following form : Number of autopsy, name, sex, color, age, address, occupation, nationality, married or single, place where examination is held, time commenced, time autopsy ended (give hours and minutes, day, month, year). If in a hospital, give the ward and bed numbers ; date of the first visit of attending physician in last illness ; last visit ; date and hour of death ; number of hours the autopsy commenced after death ; state of weather (cold, mild, or hot) ; mode of death, whether sudden or slow ; clinical diagnosis ; name of attending physician ; names of physicians present at the autopsy ; permission to hold the examination given by whom ; performed by whom ; pathologic diagnosis ; specimens taken ; character of preservatives used.

First make a thorough examination of the surroundings of the body, its position, near-by bottles, fluids, stains (upon the clothing, carpet, walls), implements. Inspect the body (naked), determine probable age, sex, height, weight, general

nutrition, hair. Observe the signs of death and decomposition (rigor mortis; postmortem lividity); presence of wounds. Measure the size and length of the head, chest, arms, waist, legs. Examine and inspect each individual part of the body: hair, eyes, ears, nose, extremities, external genitals, back. Look for the presence of diseased joints, edema, hernia, hydrocele, jaundice, fracture, dislocation, scars (syphilis), malformation.

*In the New-born.*—Examine for inflammation of the cord, ophthalmia, hematoma, dislocation, fracture, hernia (umbilical especially), spina bifida, skin disease (syphilis), malformation (harelip), cleft-palate, tongue-tie, imperforate rectum), monstrosities, abnormal openings.

(B) **Internal.**—Begin the internal examination by placing the body upon a board supported by trestles or on a table. Have a pail of water at hand, and protect the surroundings by newspapers or a rubber sheet.

*Order of Examination.*—Stand upon the right side of the subject (body placed near the edge of the table, having a block under the neck); examine abdominal cavity, thoracic cavity, pericardium, arch of the aorta, heart, nares, larynx, trachea, lungs (left one first), spleen, intestines, left adrenal and nerve ganglia, left kidney, right kidney, ureters, bladder, in the male, the prostate, spermatic cord, testicles; in the female, uterus, tubes, ovaries; duodenum, stomach, esophagus, liver, pancreas, retroperitoneal glands, thoracic duct, aorta, vena cava, head, membranes, eye, ear, spinal cord; other organs; remarks; report of microscopic examination.

**Thorax and Abdomen.**—Make a sweeping incision in the middle line, extending from the top of the sternum to the pubis; examine the soft parts as they are cut through (pass to the left of the umbilicus, to avoid injuring vessels running to the liver). Inspect the abdominal cavity before disturbing the viscera. Note the relations, color, abnormal contents, peritoneum. Open the thorax by removal of sternum and costal cartilages (cut through the costal cartilages from below upward so that the bone flap may be turned up on the face of the body). Dislocate the clavicles and first ribs, turn the anterior walls of the thorax inward



over the ends of the cut ribs (protects the operator from wounds of his hands from the bone spicules). Increase the size of the abdomen by: (a) Cut at right angles to the central incision upon each side; (b) make a subcutaneous incision, cutting through the recti muscles and tissues just above the pubis; do not cut through the skin (better plan, as less suturing will be required to close the opening).

**Spinal Cord.**—Examine the soft parts of the back and expose the spinal column by a median incision extending from the base of the neck to the coccyx (arch the body upon blocks); expose, examine, and divide the bones with chisel, saw; examine the spinal cord and coverings. Observe the general relations and the individual divisions of the dura, pia, and spinal cord itself. Look for wounding, hemorrhage, fracture, dislocation, malformation, abscess. Remove the cord and secure a specimen of the spinal fluid for further examination, or close the soft parts with a running (continuous from within outward) suture.

**Head.**—Turn the body upon its back. Secure the head by placing it upon a block. Part the hair across the crown (vertex) from above the ears (if a female). Make an incision in the line of the part extending from one mastoid process to the other. Examine the scalp for vascularity, thickness, and new growths. Dissect the scalp from the skull, turning the fore-flap down over the face (protect the subject's eyes and nose from disfigurement with pads of cotton); turn down the posterior flap. Saw through the skull in a longitudinal circumference (outline with a lead-pencil) on a plane slanting from before backward, one-half of an inch (1.25 cm.) above the external auditory meatus (circular method), or in two planes which meet at an obtuse angle in the temporal region (angular method). Hold the head when sawing with a towel wrapped around the left hand; saw through only the first two tables of the skull; cut through the innermost carefully with a hammer and chisel (skulls vary in thickness and are thinnest over squamous portion of the temporal bones). Examine the periosteum, bone from without, remove the skull-cap (calvarium). Observe the general relations and presence of bone disease from within; adherent

membranes (dura is normally adherent in infancy). Open the dura and reflect it back over the occipital bone. Open the longitudinal sinus with scissors. Examine the pia mater. Do not mistake Pacchionian bodies for tubercles; cut the optic nerves and ophthalmic arteries long. Raise the frontal lobes and olfactory bulbs; cut down and detach the pituitary body. Cut the internal carotid arteries, third, fourth, fifth, and sixth nerves; cut the tentorium cerebelli close to the temporal lobes. With the left hand under the brain with a long knife cut the cord low down in the cervical region and remove the brain, weigh it, continue the examination while holding it upon a towel (folded like a turban) or on the hand.

**Brain.**—Examine the fissures, giving attention to the course of the middle cerebral artery (called the artery of cerebral hemorrhage), fourth ventricle, and circle of Willis. Incise and examine the interior of the brain, ventricles, ependyma, choroid plexus; make gross sections (by slicing) of the hemispheres; observe the ganglia; slice the cerebellum, pons, and medulla.

Make microscopic sections of various parts of the brain. Harden brains by placing in Müller's Fluid as soon as removed.

*Hamilton's Method.*—Remove the dura; the brain is then covered with its pia and arachnoid; weigh it; inject the vessels at the base of the brain; immerse in the fluid.

**Face.**—Examine for bruises, fractures. Examine nasal cavities, parotid glands, eyes (retina, choroid, and eyeballs); make microscopic sections.

**Thorax.**—Examine the sternum and soft parts from within; pleural cavities; middle mediastinum and contents. Observe the presence of enlarged glands; thymus gland; pericardium (incise longitudinally), contents.

**Heart.**—Examine the exterior; incise: (a) *Primary incisions* (to be made while the heart is in the body).—*First incision*: In the right auricle, starting midway between the superior and inferior cavæ, then down to the auriculoventricular ridge. *Second incision*: In the right ventricle from a point just below the end of the last incision (from below the ridge down to the apex of the right ventricle). Examine



the right heart, size of the valves, nature of blood-clots. A milk spot on the heart is due to connective-tissue formation, showing the location of old pericarditis. Wren's "breast condition" consists of areas of fatty degeneration in the muscle of the heart. Fenestration of semilunar valves consists of small openings through the valve leaflets. Imbibition, transmission of coloring-matter from the blood into the valves (colors them reddish). *Third incision*: Start at the base of the pulmonary vein and extend to the left auriculoventricular septum. *Fourth incision*: In the left ventricle, starting from a point below the end of the last incision (below the septum) and extending down to the apex. Remove the heart from the body. Place it upon a folded towel or hold it in the left hand when making (*b*) secondary incisions. *Fifth incision*: From a point midway on the second incision (right ventricle) extend to the middle of the pulmonary artery (open between the two anterior leaflets). Test the competency of the heart-valves (aortic and pulmonary) before making the secondary incisions by pouring in water from above. Some little leakage will be found in a normal specimen (water being a thinner fluid than blood). Measure the valves with a graduated cone. Cut up the interventricular septum (left ventricle side) to the auricular appendix, keeping to one side of the aorta. Join the primary incisions.

**Lungs.**—Examine the pleura for adhesions (a "bread-and-butter" condition indicates croupous pneumonia), color, relations, other diseases; internal inspection. Open the lungs by an incision from apex to base, or slice the lung, making pressure with the left hand. Inspect the trachea, parenchyma, and smaller bronchi, vessels, peribronchial glands, and observe the posterior segments of the ribs.

**Neck.**—Requires a careful dissection so as not to destroy the contour of external parts. Examine the mouth, condition of teeth (fillings, other dental work); larynx; deep lymph-glands of the neck, deep muscles of the neck, esophagus. To remove the tongue, esophagus, and trachea draw the head to the edge of the table, dissect out the parts through a median incision extending from the symphysis of

the lower jaw to the top of the sternum, or dissect out by reaching up from below, and remove by drawing and a circular dissection.

**Abdomen.**—Examine carefully the anterior layer of the peritoneum and the mesenteries. The spleen is the first organ to be removed. Note the external and internal appearances (examine for supernumerary spleens).

**Adrenals and Kidneys.**—Note condition of the capsules and parenchymas of these (the adrenals must not be mistaken for omentum); observe the tufts and pyramids of the kidneys; note disease conditions (calculi, nephritis); make sections; examine the pelvis of the kidneys and the ureters.

**Bladder.**—Note the external condition; remove the bladder and rectum by a circular incision, keeping close to the pelvic walls; determine its capacity and contents; thickness of its walls; examine the urethra, penis, prostate gland, seminal vesicles and ducts, spermatic duct, scrotum, testicles.

**In the female** examine the internal organs: broad ligament and parametrium, tubes, ovaries, and Douglas's pouch; examine for traces of extra-uterine pregnancy; uterus, vagina.

**Rectum.**—Examine externally and internally, noting condition and presence of disease of the mucous lining.

**Duodenum and Stomach.**—Examine externally and internally (corrosives swallowed will show greatest effect in the esophagus and cardiac end of the stomach). Open these in the body by an incision along the duodenum and the lesser curvature of the stomach. Flush out the contents with water by dropping from a sponge.

**Liver Ligaments and Ducts.**—Examine the ligaments and ducts, portal vein.

**Gall-bladder and Liver.**—Examine externally and internally; capsule, lobules, parenchyma; note the presence of various disease conditions. Look for the papillæ of the common bile-duct, squeeze a little bile through it, or pass a broom splint (to prove patency). Weigh, measure, and slice the organs.

**Pancreas.**—Inspect gland and duct, making sections.

**Solar Plexus Nerve Ganglia.**—Note relations and condition.

**Mesenteries.**—Examine for morbid growths, rents.

**Intestines.**—Dissect out after first ligatures near the end of the duodenum and rectum. Wash out the intestines by attaching to a spigot. Lay open the intestines after removal from the body and examine for disease conditions (open along the mesenteric attachment; morbid conditions are most often upon the free inner surface). Aromatic spirits of ammonia will remove the fecal odor from the hands.

Examine the arch of the aorta and great vessels, veins, lymph-glands, retroperitoneal glands, thoracic duct, internal muscles of the body, diaphragm, and psoas muscle.

**Extremities.**—Examine the soft parts and bones (periosteum, medullary cavity, osseous structure, marrow), ligaments, joints, synovial membranes.

The weights and sizes of organs vary in the different nationalities. The average (1) height of a European is:

Male adult . . . . .	172.00 cm.
Female adult . . . . .	160.00 cm.
New-born (male) . . . . .	47.4 cm.
New-born (female) . . . . .	46.75 cm. (Zeigler).

At the end of the second year of life a child is one-half the height it will be when fully grown. (2) Weight:

Male adult . . . . .	65 kilos.
Female adult . . . . .	55 kilos.
New-born child . . . . .	3250 gm.

*American scale:*

A man of 5 feet should weigh	120 pounds.
A " 5 " 3 inches should weigh	130 pounds.
A " 5 " 6 " " "	143 "
A " 5 " 9 " " "	155 "
A " 6 " " " " "	170 "

The average American new-born infant is 50 to 51 cm. (19.6–20 in.) in length and weighs from 3500 to 3600 gm. (about 7½ pounds).

To approximate the age of a fetus measure the body length in centimeters. If over 25 cm. long, divide by 5 to get the age of the fetus expressed in months. Below 25 cm in length, take the square root of the number to obtain the intra-uterine age expressed in months.



## COMPARATIVE WEIGHTS OF PARTS AND ORGANS.

Skeleton weighs . . . . .	11,560 gm. adult.
“ “ “ . . . . .	445 gm. new-born.
Muscles weigh . . . . .	29,880 gm. adult.
“ “ “ . . . . .	625 gm. new-born.
Brain weighs . . . . .	1,397 gm. adult (49½ oz. male; 44 oz. female adult).
“ “ “ . . . . .	385 gm. new-born.
Cord (minus membranes) weighs . .	48 gm. (1½ oz.). Proportion to brain weight, 1 : 33.
Heart weighs about . . . . .	304 gm. adult.
“ “ “ . . . . .	24 gm. new-born.
“ “ “ . . . . .	10 to 12 oz. ( $\frac{1}{16}$ of body weight).
“ “ “ . . . . .	8 to 10 oz. ( $\frac{1}{14}$ of body weight).
Pathologically, the heart may weigh 2 or 3 pounds.	
Lungs weigh . . . . .	1172 gm. adult.
“ “ “ . . . . .	58 gm. new-born.
“ “ “ . . . . .	42 oz. The right weighs 2 oz. more than the left. Proportion to body weight, 1 : 37 in males, 1 : 43 in females.
Liver weighs . . . . .	1612 gm. adult (50 to 60 oz. The weight is from $\frac{1}{3}$ to $\frac{1}{6}$ less in female).
“ “ “ . . . . .	118 gm. new-born.
Pancreas weighs . . . . .	201 gm. adult (varies 2 to 6 oz.).
“ “ “ . . . . .	11.1 gm. new-born.
Right kidney weighs . . . . .	141 gm. ad't (4½ oz. to 6 oz. male; 4 oz. to 5½ oz. female).
Left kidney weighs . . . . .	150 gm. adult.
Suprarenals weigh . . . . .	60 to 120 grains.
Testicles (varies) . . . . .	48 gm. adult (6 to 8 dr.; the left is somewhat heavier).
“ “ “ . . . . .	0.8 gm. new-born.
Spleen (varies) . . . . .	96 to 192 gm. (3 to 6 oz.). (Ratio to body weight is 1 : 400).
Thyroid gland weighs . . . . .	4 to 8 gm. (1 to 2 dr.).
Thymus gland weighs . . . . .	16 gm. ( $\frac{1}{3}$ oz. at birth).
Stomach weighs . . . . .	144 gm. (4½ oz.).
Prostate weighs . . . . .	24 gm. (6 dr.).
Uterus weighs . . . . .	38 to 48 gm. (1 to 1½ oz.).
Ovaries weigh . . . . .	4 to 8 gm. (1 to 2 dr.).
Volume of the brain averages . . .	1330 c.m.
Specific gravity . . . . .	1035 to 1040.
Length . . . . .	160 to 170 mm. in man.
“ “ “ . . . . .	150 to 160 mm. in woman.
Transverse diameter . . . . .	140 mm.
Greatest vertical diameter . . . .	125 mm.
Heart thickness; right ventricle . .	2 to 3 mm.
“ “ “ left ventricle . . . . .	7 to 10 mm.
Pathologically right may reach 7 to 10 mm. or more.	
Pathologically left may reach 20 to 25 mm. or more.	



## MEASUREMENTS.

Diameters of the aortic orifices . . . . .	23 to 25.6 mm. ( $\frac{9}{10}$ to 1 inch).
"    "    mitral " . . . . .	30.7 to 35.8 mm. ( $1\frac{1}{5}$ to $1\frac{3}{5}$ inches).
These orifices allow the insertion of two fingers.	
Pulmonary orifice . . . . .	28.1 to 30.6 mm. (1.1 to 1.2 inches).
Tricuspid " . . . . .	38.4 to 44.8 mm. (1.5 to 1.8 inches).
Admits three fingers.	
Spleen: Volume . . . . .	221.5 c.c.
Length . . . . .	12 to 14 cm.
Breadth . . . . .	8 to 10 cm.
Thickness . . . . .	3 to 4 cm.
Kidney: Length . . . . .	11 to 12 cm.
Breadth . . . . .	5 to 6 cm.
Thickness . . . . .	3 to 4 cm.
Liver: Transverse . . . . .	25 to 30 cm.
Right lobe . . . . .	18 to 20 cm.
Left lobe . . . . .	8 to 10 cm.
<i>Longest diameter:</i>	
Right lobe . . . . .	10 to 12 cm.
Left lobe . . . . .	15 to 16 cm.
<i>Greatest thickness</i> . . . . .	6 to 9 cm.
Alimentary tract varies greatly in length:	
Total length . . . . .	30 feet (varies) (9 m.).
Small intestine . . . . .	20 feet (6 m.).
Large intestine . . . . .	5 feet (1.5 m.)
<i>Capacity:</i>	
Small intestine . . . . .	3 liters.
Large intestine . . . . .	3 liters.
Capacity of esophagus and stomach . . . . .	2 liters.

*To Tell the Right Lung from the Left.*—Right lung has three lobes, the left has but two (not absolute). Looking from above the relationship is: bronchus, artery, vein in right lung; the left presents artery, bronchus, vein. The apex of either lung may be readily distinguished from its base.

*To Distinguish the Right Kidney.*—Spleen impression is shorter, broader, and weighs 5 to 7 gm. ( $1\frac{1}{2}$  dr. lighter than left). The spermatic or ovarian veins enter directly into the vena cava. The left kidney is longer and narrower, weighs 5 to 7 gm. ( $1\frac{1}{2}$  dr. heavier than right). Spermatic or ovarian veins enter into the renal vessel. The posterior kidney surface is fatter than the anterior; external border is convex; internal border is concave. The top is more expanded than the bottom. At the hilum the relation of entering structure is vein, artery, ureter. In postmortem examination identify

by making a single designating incision in the left kidney; make two incisions in the right or none.

#### IDENTIFICATION OF BLOOD-STAINS.

Identify blood from—(a) Dyes; (b) fruit-stains; (c) rust; (d) wines; (e) tarry or greasy substances.

Prove whether the stain presented for examination is blood or not; determine whether it is human blood or that of a lower animal; recent or old; arterial or venous; from an adult or a child; menstrual.

Be careful in methods of examination and in sealing and labeling the specimens. Account for them from the time received until they pass from your hands. Note the evidences as found; record before carrying them away.

Specimens are called exhibits and may be numbered or lettered to designate them.

Different materials are stained differently by blood: stone, fabrics, wood, metals. Sometimes artificial light is better to study blood-stains in (stains on wall-paper and furniture show best at night in artificial light). Examine stains with a hand-glass. A clean knife thrust in vinegar or into a lemon causes stains similar to blood-stains; scrape off and test for iron or acids. Test suspected stains of dyes (log-wood, madder, or anoto) according to the fabric with a hand-glass or chemically. Grease spots are removable by the application of a hot iron and brown paper, benzine, naphtha. Fruit- and wine-stains may be dissolved out by ammonia. Paint stains, test for iron or lead. After all your testing you cannot swear positively that a given stain is blood.

**Tests for Blood.**—(a) **Chemic.**—Dissolve portions of the stained fabric in salt solution, add glacial acetic acid; then examine a specimen under the microscope for hematin crystals.

(b) **Guaiacum Test.**—To a watery solution of the stained fabric add a few drops of guaiacum; a milky discoloration occurs if blood is present. Add a few drops of hydrogen dioxide and secure a blue color reaction.

(c) **Spectroscopic Test.**—Is uncertain because different solutions of blood give different bands.

(d) **Microscopic Examination.**—Measure the size of the corpuscles and observe their shape. In mammals the cells are round; oviparous (birds), the cells are oval and nucleated. Differences occur in the sizes of mammalian corpuscles. The red blood-cell varies from  $\frac{1}{3500}$  to  $\frac{1}{3000}$  (0.007–0.008 mm.) of an inch in diameter.

**Physical Characteristics of Stains.**—Drops falling but a short distance are oval; when from a greater distance, the spots are irregular and spattered. Spattered blood may sometimes be traced to its source—the irregular portion points away; smooth, rounded end toward the source.

#### POISON-DETECTION TESTS.

##### 1. **Mineral Poisons.**—(Mercury, arsenic, or antimony.)

*Method.*—(A) Of the suspected food-stuff, body-fluid, or tissue make a paste by adding distilled water; boil the mixture for a couple of minutes, taking care that the organic matter does not char. Add a quantity of dilute hydrochloric acid equal to one-seventh of the whole volume. Now place a small strip of copper-foil in the solution and stir. If mercury, arsenic, or antimony be present, a grayish or black deposit will occur upon the foil (sulphur in the organic matter may cause the deposit; therefore do not decide at once). If not concentrated enough to form a deposit, evaporate some of the solution. Remove the copper strip, wash, and dry it carefully. Now if by rubbing with the finger the foil takes on a mirror-like polish, mercury is indicated. If no polishing exists, mercury is not present.

(B) To determine whether arsenic or antimony is present or to make sure that mercury is present, place the strip of foil in a reduction tube (a thick, strong test-tube); heat slowly. Sublimation indicates the poisons; small globules of mercury (is not water because they are not transparent) will collect at the uppermost, coolest part of the tube. Below, the presence of octahedral crystals indicates arsenic. Amorphous with only a few octahedrals indicates antimony (Reinsch's test).

##### 2. **Marsh's Test for Arsenic or Antimony.**—*Appa-*



*ratus*.—A hydrogen generator (closed glass vessel containing some bits of metallic zinc to which a quantity of water and a small amount of sulphuric acid has been added); pass the hydrogen through a U-tube containing the suspected substance, and ending in a tip (drawn tube). Sublimation occurs. Heat the drawn tube and ignite the gas flowing from the tip. A deposition of gray or dark material will take place upon a porcelain dish held in the flame. If it is arsenic, a solution of sodium or calcium hypochlorite will dissolve it. If not so dissolved, it is antimony.

3. **Detection of Copper.**—Dissolve the suspected substance, if solid, in distilled water; acidulate with hydrochloric acid; warm the solution slowly in a test-tube; dip a clean pen-knife blade in the mixture. If copper is present, electric action will cause a deposition of copper on the tip of the knife-blade.

4. **Phosphorus (Mitscherlich's Test).**—Distil the suspected substance with diluted sulphuric acid, conducting the vapors through a glass tube surrounded by a glass condenser. If phosphorus be present, the vapor will be continuously luminous if observed in the dark.

5. **Strychnin.**—Make a watery solution of the suspected substance; evaporate to dryness in a small porcelain dish; place a small crystal of potassium permanganate at one side of the dish, stir it up with a few drops of sulphuric acid, then stir in the substance with a glass rod. A pure blue color which gradually changes to a purplish indicates strychnin.

6. **Morphin.**—Place a portion of the suspected solution in a small porcelain dish and evaporate to dryness (over a water-bath) if a liquid. If a solid, apply the test at once. Stir up with a few drops of sulphomolybdic acid; a deep purplish-red indicates morphin.

7. **Aconite.**—There is no characteristic analytic test. Its presence can be inferred by the physiologic test (a peculiar, tingling, benumbing sensation imparted to the mouth and tongue when tasted, due to aconitin). May further test by injecting some of the fluid vomit, excreta, or expressed tissue into a small animal—rabbit or guinea-pig). Microscopic



study will aid if a decoction from the leaves or the root has been swallowed.

#### LIFE-INSURANCE EXAMINATION.

The position of medical examiner and medical director of a life-insurance company calls for an alert observer and a skilful diagnostician. The physician must also possess tact in handling individuals and bear in mind that he protects the interests of the body of persons already insured in the company which he represents; that the majority of applicants are healthy and that he is not engaged in examining patients for disease but individuals for health. Longevity is the standard for life insurance, and "average good health" is what is sought. Focusing the results of an examination into a few facts regarding the present condition of the applicant and his degree above or below the standard are the requirements for reaching a correct conclusion as to the "risk" in a given case. Detection of fraud or misrepresentation upon the part of the applicant when such cases appear will depend upon this point.

**Examination with Deduction.—Race.**—Americans are the best not because of strength, but on account of toughness and endurance (gastro-intestinal diseases and tuberculosis affect chiefly). Irish have general good health, but are not so enduring. Negroes, particularly mulattoes, show a tendency to syphilis, tuberculosis; Chinese, general unhealthy life, morphin habit; Germans have small endurance, tendency to suicide and hernia; English, diseases of the circulatory system; French, nervous diseases; Hebrews, diabetes.

**Sex.**—Females are poor risks; greater likelihood of fraud; concealed pelvic disease not easily apparent.

**Age.**—Compare the individual's given age in years with the physical condition he presents; rapid ageing lowers the expectancy.

**Occupation.**—The condition of health and life expectancy will depend to a degree upon the pursuit; weavers, miners, marble-workers, and potters show a decided tendency to

have tuberculosis; porters, aneurysm; barkeepers, alcoholism.

**Habits.**—The risk is greater in an idle man than one who is employed in some regular work. Alcoholism—(a) Steady drinkers; (b) spree drinkers; (c) sneak drinkers (one who conceals the habit is the worst risk). Syphilis reduces the vitality. Prostitutes, gamblers, and criminals are bad risks.

**Speech.**—Many insidious diseases of the central nervous system give sign in the speech (aphasia, tremulous enunciation, hesitancy).

**Gait.**—Betrays general physical condition, points to the presence of nervous diseases (paralysis, deformity, as flat foot).

**Face.**—Regularity of features indicative of health; sunken features, saddle nose (syphilis), puffiness beneath the eyes (kidney disease), skin (eruption, pock-marks), eyes (squint, clearness of the cornea), scars (showing previous head or brain injuries), expression, tremors.

**Mouth.**—Examine the mouth for ulcers, scars left by syphilis or epilepsy (involuntary biting). A local browning of the tongue may be due to a decayed tooth. Note the character of the teeth (as a general indicator of the body stamina).

**Chest.**—Contour; rachitis (pigeon-breast), tuberculous (funnel shape); asthmatic (barrel). A long chest with narrow bones denotes weakness; wide and long bones, imply strength. Judge of the nutrition from the size and shape of the muscles; sharp outlines show strength; rounded smooth lines, lack of development. Symmetry of the body is better than size. Athletes and consumptives generally show the greatest expansile power.

**Skin.**—Note the skin as to hue, texture, moisture, scarring, swellings. The mucous membranes (conjunctivæ, mouth) are better indicators than the skin. There is a certain natural pallor found in most people. Paleness may be brought on by the use of tobacco (smoking or chewing). A more marked paleness is a sign of anemia.

**Neck.**—Deformities (wounds), glands (syphilis).



**Abdomen.**—Scars, fat, condition of the abdominal rings (shows the tendency toward hernia).

**Back.**—Observe vertical contour (deformity, tuberculosis). Hunchbacks are poor risks.

**Hands.**—Occupation (musicians, journeymen), clubbed fingers (chronic disease, as tuberculosis). Look for deformities, contractures, wrist-drop (nervous disease, lead-poisoning).

**Urinalysis.**—Test for albumin, sugar, microscopic; quantitative.

**Legs and Feet.**—Muscular development, bony frame. Deformities (club-foot). Knee-jerks (locomotor ataxia).

**Intentional Injuries.**—Incisions are usually parallel; a right-handed person will cut left (deepest) to right.

**Mutilations.**—The individual desires amputation; right-handed person will present an injury of his left hand or foot; a left-handed person, of the right.

**Government and Corporation Insurance.**—It is compulsory in some countries (Germany) for corporations, as railroads, to insure their employees.

### MEDICAL JURISPRUDENCE.

Includes within its bounds criminal, naval, military affairs, hygiene, insanity.

**Definition.**—Medical jurisprudence is the science of medicine applied to law. It is founded upon decrees and laws. In every case of violence examine all the conditions (for legal purposes) to prove that other conditions do *not*, as well as those which *do*, exist.

**Modes of Entering upon Practice.**—In Great Britain medical practice is divided into that of—(a) Surgeons; (b) physicians and apothecaries: Surgeons there are not M. D.'s and are called Mr.; physicians are M. D.'s and are called Dr. The greatest reaction in the stringency of medical practice laws occurred in the first half of the last century, when homeopathy appeared. In America the mere possession of a diploma qualifies the holder to practise medicine in some States; registration or license examinations is re-

quired in others ; this requirement applying to assistants as well. The common method is to pass State Examining Boards, followed by a registration at the prothonotary or county clerk's office. Some States allow consultants coming from other States to enter as such, also grant the same privilege to army and navy surgeons. One practising upon the border of two States (registered in one) may enter the other to see his own patients, but must not open an office there. Physicians who are resident in hospitals have special laws in relation to their practice. Where registration only is necessary, protection is accorded simply from unqualified practitioners, not against unfitted physicians.

**Consequences of Illegal Practice.**—One may not collect fees by process of law or is not exempted from army or jury service, nor can he give a certificate of death or insanity, also cannot be a medical expert. Proofs of qualification depend on the laws, diploma, license ; proof of registry may be demanded.

What constitutes a practice of medicine must be determined by a jury sometimes. Apothecaries, barbers, grocers, Christian Scientists, divine healers, electric healers, osteopaths, all practice medicine to a degree.

**Definition.**—Medical practice consists of any action, medical or surgical, which might injure or cure a patient.

**Fees.**—The Fellows of the Royal College of Surgeons are not allowed to sue for fees according to their ethics.

Fees are legal as a contract is implied, and are collectible within limits by process of law.

Who is responsible for the payment of the fee? If nobody else, then the messenger, children, their parents or guardians ; jury decides sometimes. The parents of children are always responsible unless provisions are made from the child's personal estate. In the case of step-parents and orphans, must come from the child's estate, unless otherwise designated.

**Railroad Surgery.**—When called in for such work, secure a written agreement from the agent of the road to bind the company for payment of services. For commitments to insane institutions and for other certificates the person whose



name occurs where "promise to pay" is printed is responsible. Ship surgeons would oftentimes be enabled to prevent damage suits growing out of accidents aboard-ship if they secured at the end of their treatment of each case a statement that the surgeon's work had been satisfactory to the patient.

*Fees for Experts.*—In some States one may refuse to testify unless paid for expert testimony. It is not wise to refuse to testify, but make your agreements for payment before the trial in writing.

**Feigned and Fictitious Diseases.**—Audition (hearing) and vision are important from a medicolegal standpoint, as they may be feigned or fictitious.

A *fictitious* disease is one which is purely feigned.

A *factitious* disease is one which a patient inflicts on himself (as sailors, soldiers, or criminals do to avoid service).

It is hard to disprove the symptoms which the patient assumes present. Some symptoms cannot be simulated, as Argyll-Robertson pupil, choked disc, knee-jerks, the pallor of the face preceding an epileptic attack.

**Audition.**—Necessary to be very circumspect in cases of loss or assumed loss of hearing.

In the first place, proof must be presented that the hearing was not lost before the accident.

Test carefully, with yourself or some one else as a comparison.

Life-insurance and accident policies, as well as legal cases, often demand these tests.

*Bilateral Deafness.*—To prove, when assumed: Discuss the case before the patient, varying the tones of your voice, watching closely to detect signs of deception. Begin in a loud voice, then gradually lower and alternate, and the patient, in trying to hear what is said, may expose himself. Phonograph useful sometimes. Consultation; propose trephining. Etherization, and then, when partially conscious, the patient will answer questions if hearing is not deficient. Waking the person in the morning by shouting out loud, commencing with low-toned calls; no lights; careful to make no other noise, and stand a certain distance

from the bed. Always make a careful internal and external examination of the ear.

*Unilateral deafness* is sometimes assumed. Test by a stethoscope (double) attachment, plugging on one side. Whisper a count in low tones. Can easily confuse a patient.

*Dulled Hearing, Assumed.*—Can prove by using the tuning-fork, cotton, or a wetted finger in the dulled ear (will sound louder, but patient will say it sounds lower), using tuning-fork and Galton's whistle.

*Another Deceit Test.*—A watch, moved up from the back of the head to the vertex may thus also confuse a patient.

**Vision.**—Defective vision may be assumed by witnesses or experts in law cases. Feigned blindness, unilateral, assumed, easy to discover by employing the following:

*Prism Test for One Eye.*—Carry prism before sound eye; have one light; patient says he sees one—should see two.

Before the sound eye, after manipulation, place a frame with a double convex lens in it.

*Color Tests (Complementary Colors).*—Red and green glasses (eye-pieces); write on a black background; green letters disappear when looked at through red, and vice versa.

*Stereoscope.*—Have blue and red squares, one of each before patient.

Color glasses; write with blue and red lines.

**Malpractice.—Definition.**—Malpractice means a want of *reasonable* medical or surgical skill, as a result of which patient is injured or loses his life.

Medical, and especially surgical, malpractice is used as a means of blackmail; sometimes a patient is in league with a lawyer.

Malpractice is divided into: Wilful malpractice; ignorant malpractice; active malpractice (too much done); passive malpractice (neglect to do).

**Insanity**, called traumatic insanity, resulting from laparotomies or operations on the head are sometimes made the subject for claims.

**Fat-embolism.**—Results from fibrin ferments in the blood,



said to be due to surgeon's carelessness sometimes, and made a source for a suit.

**Blood-poisoning.**—Applies now to those who do not take reasonable precautions, as followed by the general opinion of the medical community where a resident.

**Mistaken Diagnosis.**—Suicides have resulted when the doctor, mistaking an aneurysm for an abscess, has plunged a trocar in with fatal result. The law does not hold such a one to a very strict account when due to a mistaken diagnosis.

*Suits, Suicide, Aneurysm for an Abscess.*—A question of this kind calls up a question of diagnosis; law not so severe in a case like this as when a physician, knowing what was the matter, did a wrong thing.

In great emergencies, war-time, epidemic, responsibility is not so great.

**Guaranty or Warranty of Cure.**—Means simply a guaranty to cure. The physician then binds himself by contract and is liable.

**Fractures** are a common cause for suits; source of blackmailing. A surgeon may protect himself in cases likely to be brought into court by means of *x-ray* photographs or by making two plaster-of-Paris casts of the injured parts, one before assuming charge and the second at the end of treatment (plastic surgical work—about the face, contracted hands—may also be protected in a similar manner).

*Method of Making Casts.*—To model a forearm after a Colles' fracture: wash the parts (shave the hairs if very coarse and numerous); dry thoroughly, anoint the skin of the hand and forearm with sweet oil.

(1) *To Make a Mold.*—Prepare a board 1 inch (2.5 cm.) thick, 10 inches (25 cm.) wide by 2 feet (60 cm.) long; attach a 4-foot (1.2 m.) length of stout but fine fishing-cord at its middle to a small staple; set the staple up at the middle of one end of the board. Prepare 6 lbs. (3 k.) of plaster-of-Paris by stirring in water until a thick, creamy, but smooth mass is formed; pour half of the mixture along the center of the board; sink the patient's forearm and hand (have the fingers pointed toward the staple) into the mass, building up



a mold to about one-half the height of the hand and forearm laid flat; draw up the strings and lay them close to the skin surface from the finger-tips to the elbow (the oil will cause them to adhere); pour on the rest of the plaster mixture, covering the hand and lower arm; setting will take place in from five to fifteen minutes; when the mass has dried to about the consistence of cheese, cut through the mold by drawing the strings outward upon either side, thus forming a mold of the upper and lower surfaces of the extremity. Remove the patient's arm from the lower mold after lifting off the top (allow the mold to dry out for a few minutes longer after halving).

(2) *To Form a Cast.*—Close the mold, fastening with adhesive straps or a bandage. Thoroughly dry the mold (set the plaster); oil the inner surface of the mold by pouring in a little sweet oil (f3j—4 c.c.) and rotating until entirely covered (drain off the excess). Mix up 2 lbs. (1 k.) of plaster-of-Paris into a smooth syrup by the addition of water and stir carefully (to avoid lumping); pour the mass into the mold; set it aside for one hour; pry off the mold and a cast of the arm remains. A cast of the face may be made by oiling the parts in a similar manner as for the arm; insert a quill into each nostril, plugging the crevices with cotton; place cotton pledgets in the external ears also; lay two strings upon the face, crossing at right angles between the brows. The mold is now to be prepared from a plaster mass laid on the surface. When sufficiently set (five to twenty minutes required when the mold is about 1 inch (25 cm.) thick), remove in four sections by cutting through with the strings. A full mold of the face may often be made in a single piece. Form a cast after lubricating the inner mold surface by pouring in a fresh plaster cream. When set, pry off the mold.

*Deformity*, want of union, and necessities for further operation are a cause for suits.

*Gratuitous services* does not take away the liability to suit. Responsibility is just the same before the law for any services, medical or surgical; every case is equally important.

The question of malpractice hangs on what is *reasonable*

skill, decided by jury or on the merit of the case. To be liable the plaintiff must prove:

1. Real injury was done.
2. That a knowledge of the case professionally was not shown.
3. That a departure was made from ordinary accepted practice of the profession in the community.

**Experimental Treatment.**—How far can you go? Law says, Not to an "extreme degree"; neither will it debar you from trying something new.

In case of *grafting an eye* failure was followed by a suit; law held the physician not liable.

**Drugs.**—Same applies; something of a knowledge must be shown to be possessed.

**Surgery.**—Questions arising on the removal of organs, ovaries, testicles, uterus, kidney, stomach; cases have been gained sometimes. Children are often injured viciously by parents for the purpose of blackmailing a physician or other individual.

The practitioner, having acted in a reasonable manner, being upheld by the profession, is then safe from liability.

The *after-treatment* is just as important; responsibility is just as great.

**Anesthetics, Rules for Using.**—If used, except in an emergency when rules may be departed from, a reliable assistant, one proficient, must administer the anesthetic. Student or nurse may not administer the anesthetic without liability to the operator in case of accident.

**Care in Giving Anesthetics to Women.**—The assistant acts as a witness; he must be legally competent, else the surgeon is held liable. In cases of death from anesthesia no one is held responsible if proper care be taken.

*Fear* has killed some patients.

Cases where used in heart, kidney, or lung disease held liable sometimes.

The question of what anesthetic to use arises sometimes.

Laws relating to druggists and dentists just about the same. Druggist shares the blame in death from overdose.



Dentists in cases where wrong teeth have been extracted are proved liable.

**Mistakes.**—Operations on wrong sides of body, wrong eye, arm; trephining. May be fatal to the patient and to the doctor's reputation.

**Professional Confidence.**—Rules vary in different States: in some it is an offense to tell anything or even to have the appearance of telling. Where confidences are upheld, you must not ask anything or tell anything which might incriminate.

*Confidence between Man and Wife.*—In some States one can be forced to give up everything known.

Knowledge gained by a physician socially or in any other way *except in practice* he is then held liable to tell.

*Waiver-in-law* means giving up a right which the law allows.

**Sacredness of the Person of Patients.**—A dead body belongs to the nearest living relative unless willed away. No right to use a patient for teaching purposes, unless he wills it; obstetric cases especially.

**Autopsies.**—You must always have the consent of a responsible person before performing an autopsy.

**Personal Identity of the Living and Dead.**—Oldest and most interesting question in medical jurisprudence. Questions of identification arise in civil and criminal suits, homicide, rape, suicide, felony cases, heirs to estates, escaped lunatics, and criminals.

*Methods of Investigation.*—Lay evidence of importance. Tradesmen, identifying those of their craft by marks or attitudes assumed.

Study, in a case: Normal characteristics (stature—of corpse especially), size, age, teeth, hair, feet, hands, fingers, toes; congenital characteristics and marks, accidental, congenital or acquired, marks, acquired or otherwise; special characteristics; Bertillon system of measurements.

Length, breadth of head.

Length of foot, of middle finger are four important measurements in this system.

Height, height of trunk, length and breadth of ear, color



of eye—7 grades. Two photographs—profile and full face.

United States Army method, used for deserters: Anterior and posterior views (photographs), tattoo-marks and scars. Indicated on charts.

Ordinary tests of age: tell by teeth, hair, ossification of bones, menstruation, figure, contour, up to adolescence.

Identify by teeth-work; records kept by dentists are of importance.

Hair dyed soon shows at roots; also has a sameness of shade which normal hair does not have.

Artificial changing of the complexion will last but a short time, when it may be detected.

Handprints (no two thumbs are alike); footprints; blood-stains. Footprints are of value to identify the living; footprints are smaller usually than the foot that makes them, depending on the manner of stepping, gait.

Mental accomplishments as a test: Voice, manner of reasoning and thinking. Even the individual himself is not sure of his own identity at all times.

**Identification of the Living.**—*Evidence from Occupations.*—(a) Jeweler, thumb of left hand is retracted; (b) shoemakers, hands; (c) dyers and tanners, hands (test, scraping of epidermis); (d) coppersmiths, hands (test, nitric acid and ammonia,  $\text{HNO}_3 + \text{NH}_3$ , blue color reaction); violinists, fingers (callused at the ends, left hand); coopers, bowed body. Take prints of thumbs on greased glass, followed by treating the glass to hydrochloric-acid fumes (to render permanent). Finger-nails, transverse and longitudinal ridges.

**Identification of the Dead.**—It is important in cases of drowning, fire, accident, exposure, criminal cases, not to be too ready to accept as final the statements of persons regarding identification, since wives and sons have been mistaken; supposed dead and missing ones returning to disprove the friends' assertions. Long dead: tell from the skeleton or parts remaining. Determine the sex from the skeleton (race also by this means), features, limbs, hair, teeth, race marks. Age of fetus from points of ossification; teeth, presence or absence of.

*The squaring of the body*, to determine the stature: arm (length of), + 6 inches (152.4 mm.) for clavicle, + 1 inch (25.4 mm.) for sternum  $\times 2$  = the stature.

Tell race by hair, skin, skeleton.

Human hair is to be distinguished from that of the lower animals.

In coroner's cases it is important to note the surroundings of the dead person *accurately*.

*Regarding Disinterred Bodies and Organs Removed from Same.*—Take great care to label and keep them securely, else you might have trouble to prove them the organs removed from the body or the remains in question.

**Aphasia.**—Aphasia is due to some lesion in the cerebral zone of language. Find affections of word-hearing, word-vision, naming. Aphasia is important in civil competency or criminal cases. Examination of a case for legal purposes: Test for the receptive side of the brain (power to hear words spoken); power to read printed matter; write; understand speech, music tones; whether patient can speak voluntarily; whether can understand speech; clearly articulate; vocabulary, one word or more; repeat after hearing; write from dictation; reading aloud or to himself; power to copy.

Defects in zone of language may occur in the sensory side (conception side) or motor (projective) side of apparatus. An individual may be *medically competent* but not *legally competent*. Question of competency arises in criminal and civil (mostly) suits as to responsibility to make contracts, notes, wills. An aphasic (in a criminal case) is liable to be leniently dealt with, but should really receive less consideration than an epileptic, who is usually held strictly accountable before the law.

**Insanities.**—The presence of insanities arises in questions of criminal nature, marriage, divorce, estates.

*Find out the laws of your own State on methods of study, committal, release, on insanity.*

Separate examination required; expert must be five years a practitioner.

**Paranoia**, called also chronic delusional insanity, primary



delusional insanity, monomania, progressive systematic insanity, is a form of insanity, usually of hereditary origin, characterized by ideas of persecution, self-importance, and grandeur. Most typical form of paranoia: Progressive systematized insanity (best name). States: (1) Self-study or introspection (weeks or months); (2) delusions with others of persecution; (3) personality transferred; importance, grandeur, unseen agencies at work, character altered. Methods—many phases: electricity, air, detectives, spies; sometimes complicated; sometimes ideas not tangible. Paranoiacs may get into court on questions of assault, murder, or defense of personal liberty. "He is the worst of persecutors himself." High public officials attacked by this sort of patients.

**Paretic Dementia.**—*Definition.*—General paralysis of the insane. Is a general disease, but attacks some parts of neuraxis more than others. The disease has as its first onset irritation, gradual oncoming of various motor and sensory disturbances, later delusions, of well-being, grandeur, gradual weakness, and loss of power of both body and mind; finally bedridden, loss of control of bladder and rectum.

Paretic dementia cases give rise often medicolegally to habeas corpus proceedings, moral lapses, and crimes. Paranoiacs commit premeditated crimes; paretic demented commit impulse crimes.

**Epilepsy.**—The degree of consciousness is the important medicolegal question in epilepsy. An epileptic, like any one else, may be subject to any form of insanity; temper of epileptic patients is irritable. Designate institutions for feeble-minded children by the term "boarding-school" when speaking to their parents.

**Simulated Insanity by the Sane; Insane.**—*Forms Simulated by Sane.*—Mania, dementia, melancholia less frequently. Delusional (criminals who have seen others). Simulators assume bizarre symptoms and sensational ideas.

*Mania*, overdone, artificial; watch day and night.

*Dementia*, most difficult to detect.

*Delusions.*—A man will say, I have a delusion. It is difficult



for an untrained person to simulate. The insane sometimes simulate insanity; occurs in hospitals, one patient assuming the delusions of other patients. You have nothing to do with the technical part of a simulator; you have only to say whether or not he was insane at the time. What do you think of the responsibility of this man is a question (a trap) which you should never answer. Answer, "it is the duty of the court to decide the responsibility of the crime, not mine."

*Lightning.*—Question arises whether a murdered person has been killed by lightning.

Signs of death by lightning: Sometimes no markings; some have tracings, some a band of destroyed tissue from head to foot; cadaveric rigidity; fusion of metal about the clothes; hyperemia of the brain; disintegration of blood. Diagnostic points of electricity in medicine (you must be prepared to swear how far electricity is of diagnostic value in proving the disease). Prove the presence of organic change.

**Electricity in Medical Jurisprudence.**—Diagnostic points of electricity in murders (you must be prepared to prove that lightning was not the cause of death).

**Pregnancy.**—If a woman be under trial or sentence of death. The law cannot require death or injury to two persons for a crime committed by a single individual; therefore woman must go to term first. Only incontrovertible signs of pregnancy will hold in law: (1) Fetal heart-sounds; (2) signs of quickening; (3) Roentgen rays (outline of child). Cannot tell for a certainty until five months. Heart-beats 120, like the tick of a watch, heard near the umbilicus. If woman dead, presence of ovum, fetus, or membranes, presence of chorion (must determine between chorion of pregnancy and chorion of menstruation), presence of sanguineous moles or hydatid moles.

Question of delivery, recent or remote. If recent, physical signs of relaxation, pulse slowed, temperature, breasts. Post-mortem signs: Size of uterus, rounded and thicker walls; evidence of placental attachment. Remote signs: Linea albicantes, nipple, and areola. Criminal abortion is the

unlawful bringing-about of the premature expulsion of the fetus—legally, from the time of conception. It is a felony to induce it—a woman is liable who commits it on herself. Even if the woman be not pregnant, it is a felony to administer anything or use instruments to bring about an abortion. For self-protection a practitioner should secure a written statement or confession signed by the interested parties and properly witnessed in every suspicious case of abortion. If the woman recovers, the incriminating evidence may be destroyed; if death be imminent, the district-attorney should be notified. A coroner or a county physician called as consultant in these cases is an additional safeguard. Without some protection the care of such a case should be refused (a prescription should not be given).

*Proof of Abortion Committed.*—Inspection of expelled contents and questioning the mother or supposed mother. Signs vary in the living according to the age of the fetus: difficult at one or two months; at three or four months swollen, patulous vulva. In the dead, same signs as for pregnancy.

**Infanticide.**—Infanticide brings up question of live birth. The infant is considered to have been born alive only when it is actually extruded from the mother. Test to determine if a new-born infant has breathed by placing a piece of lung tissue in water; if it floats, it has been distended with air and the child has breathed; if it sinks, breathing has not occurred. Death from drowning in an adult may be determined in a similar manner. If the lung tissue floats, drowning was the probable cause of death (lung tissue affected by croupous pneumonia will sink); if it sinks, the individual was probably dead before entering the water (of little value if the body has been long submerged). Legal sense, if born alive, witnesses are necessary. Next point to determine, if the child died of natural causes or not. Suffocating (overlying), non-tying of the cord (resulting in fatal hemorrhage), drowning.

*Stomach and Bowel Test.*—Floats if child has breathed, air swallowed.

*Middle-ear Test.*—Contains air after a child has breathed;



if not, contains a gelatinous mass. The non-removal of this mass may be cause of some easily unexplained total deafness.

*Live Births.*—To constitute a live birth according to law the mother must be alive at the time of the birth of the child. Cesarean section: question would arise in law. According to law, permanent viability of child after six months (one hundred and eighty days).

Superfecundation may take place; woman give birth to one child and another in course of four months.

Twin deliveries. Priority to be decided by witnesses or by court decision.

**Survivorship.**—Question of who dies first—when two or more individuals die at or near the same time, question as to where the inheritance shall go. In absence of facts: Male between fifteen and sixty the elder. Code Napoleon was based on the age of each—fifteen to sixty.

**Rape.**—Questions: Age of woman; volition; drugs; threats or persecution.

Age of consent thirteen to eighteen.

Rape is carnal intercourse without consent at any age; with consent (if below the age of legal consent). May be a felony or a misdemeanor, according to whether or not consent is given. Attempted rape not accomplished is a misdemeanor. Law simply requires organs in contact to constitute a rape. If a mother consents, to protect her child, it is a rape. Insane, weak-minded, epileptics are all counted as children. Hypnotism may be accomplished, but depends on the morals of the individual assaulted.

*Rape under Drugs.*—Etherizing—care as to witnesses. It will be your duty to testify as to the presence of evidence of crime having been committed. Signs of virginity (by comparison): Breasts, nipples, organs, labia majora and minora, before and after intercourse. Hymen may be worn away by masturbation or menstruation. Woman may be raped during sleep—depends on social habits (tenements, crowded, then possible, perhaps). Care always to exclude blackmail in charges of rape. It is an "indecent assault" to half force or make an examination of a woman with-



out her consent. Make examinations with greatest care and be skeptic. A weak gum-water stain is very like a dried seminal stain. Examine microscopically for spermatazoa.

Children for purposes of blackmail may be trained to accuse individuals of rape.

## CHAPTER XII.

### TUMORS.

**Definition.**—A tumor is a circumscribed enlargement of a part due to morbid growth.

**Etiology.**—True cause is unknown. Predisposing causes: heredity, congenital malformation, race, age, sex, occupation.

**Morphology.**—(1) Parablastic tumors, made up chiefly of connective tissue; (2) archiblastic tumors, growing from specialized cells; (3) teratomata, mixed tumors. Tumors are: (A) Benign: those which are circumscribed, encapsulated, painless, of slow growth, movable, do not return when once thoroughly removed. (B) Malignant, those which are uncircumscribed, painful, of rapid growth, infiltrate, involve adjacent lymphatic glands, return after removal (at original site or by secondary growth at a point removed—metastasis).

#### PARABLASTIC AND CONNECTIVE-TISSUE TUMORS.

1. **Fibroma** is made up of fibrous connective tissue.

**Morphology.**—Benign: (*a*) hard fibroma (dense, white, fibrous tissue, few cells); (*b*) soft fibroma (numerous cells, loose fibrous network).

**Sites.**—Periosteum, subcutaneous connective tissue, tendon-sheaths, submucous tissue (polypi), along the course of nerves (false neuroma); subcutaneous nerve-endings (fibroma molluscum; painful subcutaneous tubercle) are multiple; uterus, kidney, breast; papillomatous fibromata (warts). Fibromata may combine with lipoma, myxoma, myoma, sarcoma. May undergo degeneration.

2. **Lipoma.**—A fat tumor.

**Morphology.**—Benign, hard or soft, depending upon amount of connective tissue or mucoid change.

**Sites.**—Subcutaneous, subserous cellular tissue (neck, back, shoulders, mesentery). Fibroma may combine with fibroma, myxoma, or undergo degeneration (calcareous or myxomatous).

3. **Myxoma.**—Is a mucous tumor made up of tissue similar to jelly of Wharton or the vitreous humor of the eye.

**Morphology.**—Benign (except in the uterus); consistence depends upon the amount of mucoïd change which has taken place.

**Sites.**—Breast, nasopharynx (mucoïd polypi), uterus (villi



FIG. 133.—Chondroma of the thumb (Warren).

of the chorion), scrotum. Myxoma may combine with fibroma, lipoma, or chondroma or undergo degeneration.

4. **Chondroma.**—A tumor with structure resembling cartilage (Fig. 133).

**Morphology.**—Benign; metastasis has occurred to the lungs.

**Sites.**—Medulla or periosteum of bone (are usually multiple), lung, testicle, parotid gland. May combine with sarcoma, osteoma, fibroma, myxoma, and undergo degeneration (fatty, mucoïd, calcareous).

5. **Osteoma.**—A tumor of bone tissue (Fig. 134).

**Morphology.**—Benign; may be cancellated or spongy, compact or hard.



**Sites.**—Bony skeleton, joint cartilages, pleura, dura (falx cerebri); may combine with chondroma; usually remain unchanged.

6. **Glioma.**—A tumor made up of neuroglial tissue (a peculiar form of connective tissue).

**Morphology.**—Semimalignant, of moderate size, not encapsulated, similar to the gray matter of the brain.

**Sites.**—Nervous system, eye, kidney; may combine with fibroma, myxoma, sarcoma, neuroma. May undergo fatty, myxomatous, calcareous degeneration or become cystic.



FIG. 134.—Osteoma of the lower jaw (Warren).

7. **Angioma.**—An erectile tumor made up of vascular tissue.

**Morphology.**—Telangiectatic (made up of dilated loops of capillaries, arterial or venous); mother's marks; nevoids; cavernous (like corpus cavernosum of the penis); occurs in liver, spleen, kidney, eye. May combine with sarcoma.

8. **Lymphangioma.**—A tumor made up of dilated lymphatic vessels.

**Morphology.**—Found in cretinism, macroglossia (congenital enlargement of the tongue), elephantiasis (due to filaria sanguinis hominis), Barbadoes leg, lymph-scrotum.

9. **Sarcoma.**—A tumor of embryonal connective tissue.

**Morphology.**—(a) Small round-cell: numerous, closely packed round-cells (pinkish nuclei) (Fig. 135) with small

amount of stroma; looks like brain substance. (b) Large round-cell: cells larger and more closely packed. (c) Lym-

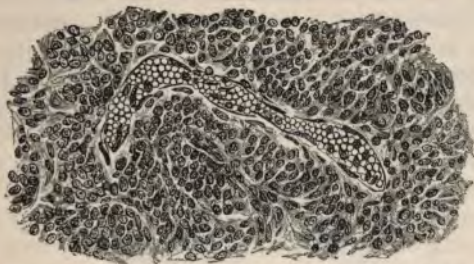


FIG. 135.—Small round-celled sarcoma: in the center is seen a blood-vessel with its wall of endothelium (Stengel).

phosarcoma: few very small round-cells surrounded by stroma, resembling intercellular tissue of lymph-glands. (d) Spindle-cell: small spindle-cells; look like muscle



FIG. 136.—Alveolar sarcoma (Warren).

(fasciculated), "recurrent fibroid." (e) Giant-cell: large cells with numerous grouped nuclei. (f) Alveolar: made of round-cells surrounded by an alveoli (stroma of connec-

tive tissue); resembles carcinoma (Fig. 136). (*g*) Psammoma (fibrosarcoma with lime-infiltrated intercellular substance); occurs in the ependyma of the brain. (*h*) Melanosarcoma (deposit of pigment-granules (melanin) in the cells and intercellular substance; nuclei usually free. (*i*) Endothelioma: sarcoma development upon the inner lining of the blood-vessels or lymphatic spaces. (*j*) Cylindroma (sarcoma undergoing myxomatous change).

Sarcomata are malignant by recurrence and by metastasis; may be soft or hard; blood-supply rich (vessels formed of sarcoma cells, but have endothelial lining); occur most commonly during the middle third of life (twenty to forty years).

**Sites.**—Skin, cellular tissue, intermuscular septa, breast, bones, nerves, brain and cord membranes, liver, eye, heart, kidney.

10. **Archiblastic.**—Specialized cell tumors. (1) **Neuroma**, made up of nervous tissue. (2) **Myoma**, muscle tumors: (*a*) *Rhabdomyoma* (striated), congenital in testicle, kidney, ovary; primary, in the heart; (*b*) *liomyoma* (non-striated), common in the uterus, prostate, esophagus, intestine. Rod-shaped nuclei distinguishes from sarcoma (spindle-cell). May combine with submucous (interstitial, subperitoneal), fibroma, sarcoma. May undergo degeneration (fatty, myxomatous, calcareous, cyst formation). Usually benign. (3)

**Epithelial tumors:**

(A) *Papilloma* (callus flesh, corns, cornu cutaneum); from mucous membranes; may be hard or soft (found in nose, intestines, bladder).

(B) *Adenoma* (atypical lymphatic glandular tissue).

**Morphology.**—May be circumscribed or diffuse. (*a*) *Cystadenoma*, cyst formation due to accumulation of secretion; occurs in ovary. (*b*) *Papillomatous*, overgrowth of cells and connective tissue into the chambers—acini; occurs in ovary, breast. (*c*) *Adenocarcinoma*, overgrowth of cells between the fibers of the connective tissue.

(C) *Carcinoma*, atypical epithelial cells.

**Morphology.**—(*a*) Squamous (epithelioma); (*b*) cylindric; (*c*) glandular. May be hard (scirrhus), soft (encephaloid or medullary), colloid (mucoid).



*Melanocarcinoma* contains a few giant-cells (epithelial).

All are malignant by recurrence (at primary site) and by metastasis (secondary growth at points removed). Occur after middle life. May combine with adenoma, chondroma, myxoma.

*Sites*.—Primary: epithelial surfaces, intestines, stomach, glands (males); breast, uterus (females). Secondary: liver, glands, lung, kidney, spleen, brain, bones. May undergo



FIG. 137.—Congenital cystic kidney, early stage (after Shattuck).

degeneration (fatty, mucoid, calcification), atrophy, ulceration, cystic.

**Teratomata** (Mixed Tumors).—(1) Cysts—(a) Non-tumorous: (A) Extravasation cyst the result of a tissue hemorrhage; (B) softening cyst (one due to a liquefaction necrosis); (C) parasitic cyst caused by the echinococcus parasite. (b) Tumorous: (A) Retention cyst, due to obstruction of gland-ducts, gives rise to accumulation of secre-

tion—for example, sebaceous, mucoid, salivary (ranula) cysts; (B) teratoid cysts (dermoids); (C) proliferation cyst (a cystadenoma, as in a multilocular cyst of ovary); (D) cholesteatoma (a dermoid cyst containing whorls of cholesterol—found in the brain); (E) congenital malformation (Fig. 137).

**Treatment of Tumors.**—General treatment of tumors, whether benign or malignant, is early removal. Injection of the serum antitoxin of erysipelas (Coley's fluid), application of the Finsen light, *x*-ray, and radium in the treatment of malignant growths has been followed by indifferent results.

**Prognosis.**—For benign growths, good; malignant, fatal in nearly all instances (operation prolongs life).

## CHAPTER XIII.

### SURGERY OF THE BONES.

DISEASES of bone are due to: (1) Injury; (2) micro-organisms; (3) diatheses (rheumatism, gout, tuberculosis, alcoholism, syphilis); (4) tumor; (5) constitutional disease (typhoid fever).

#### PERIOSTEITIS.

**Definition.**—Inflammation of the periosteum.

**Morphology.**—Seldom present uncomplicated. May be: (1) Acute, primary, or circumscribed; (2) chronic, secondary, or diffuse; exudate—(a) plastic (characterized by an outpouring of lymph or serum); (b) suppurative (infected); (c) hemorrhagic (accompanied by free bleeding).

**Symptoms.**—(a) Pain is worse at night, may be of a boring character (osteocopic); (b) tenderness; (c) swelling of periosteum, with edema and redness of the overlying soft parts; (d) elevation of the body-temperature with constitutional symptoms of fever, pronounced if infected.

**Complications.**—Abscess, pyemia, joint-involvement.

**Treatment.**—*Acute*: Enforced rest, elevation, application of cold (ice-bag), heat (hot-water fomentations), puncture (curved bistoury); if specific, antisyphilitic treatment. *Chronic*: Counterirritation, blisters, cautery.

**Prognosis.**—Good for acute or circumscribed forms; guarded in diffuse.

#### OSTEITIS.

**Definition.**—Osteitis is an inflammation of the osseous tissue. (Rare as a primary affection.)

**Symptoms.**—Osteocopic pain and tenderness.



**Treatment.**—Rest, elevation, hot or cold applications. Caries sicca (dry rot) affects the skull, ends of long bones (Fig. 138).

**Prognosis.**—Guarded.

#### OSTEITIS DEFORMANS.

Osteitis deformans is characterized by a general progressive softening and distortion of the bones.

**Treatment.**—Splinting; constitutional (supportive).

**Prognosis.**—Guardedly unfavorable.



FIG. 138.—Caries sicca, resulting in absorption and deformity of the head of the humerus (Duplay and Reclus).



FIG. 139.—*a*, Superficial sequestrum;  
*b*, Tubular sequestrum.

#### OSTEOMYELITIS.

**Definition.**—Inflammation of bone (includes osteitis (osseous tissue) and myelitis (bone-marrow)).

**Morphology.**—Is the commonest form of bone disease. May be—(*a*) Acute, simple, localized; (*b*) infected; (*c*) chronic or general.

**Symptoms.**—Simple (acute) may give rise to no symptoms. Infected and general forms cannot be separated from periosteitis unless mass destruction (necrosis) or molecular destruction (caries) with perforation of the periosteum (cloacæ) and sequestrum (dead bone mass) (Fig. 139) formation takes place. Sequestra, according to their relationship with the bone from which they are formed, may be—(a) External (peripheral or superficial); (b) central (within the interior); (c) total (involving the entire thickness of the bone affected).

*Exfoliation.*—A gradual separation of dead bone from living.

*Invagination* is a living periosteal sheath surrounding dead bone.

*Involucrum* is a new bone-sheath formation (made up of bone and periosteum) about a sequestrum.

Cloacæ are perforations in the involucrum. When sinus formation in the soft parts takes place, the presence of caries and necrosis of the bone is determined by probing and percussion.

**Complications.**—Abscess: Diffuse suppuration of soft parts, pyarthrosis (infected joints), pyemia, fracture, hemorrhage.

**Treatment.**—*Local:* Free incision of the soft parts at dependent points (avoiding nerve-trunks and important blood-vessels). Removal of dead and loosened bone masses (sequestrotomy) by scraping, use of the curet, gouge, chisel, bone forceps, Hey's saw, drainage, irrigation, splints, elevation. *General:* Supportive and stimulative.

**Prognosis.**—Guarded.

### EPIPHYSITIS.

**Definition.**—Inflammation (often with infection) at the epiphyseal junction of a long bone; occurring in the young.

**Symptoms.**—Like those of periosteitis and arthritis.

**Treatment.**—*Local:* Early, deep incision, drainage, splint, rest with elevation. *General:* Stimulative and supportive.

**Prognosis.**—Guarded. Deformity usually follows (shortening).

### OSTEOMALACIA.

(*Mollities Ossium* ; *Fragilitas Ossium.*)

**Definition.**—A progressive softening (fatty degeneration or by absorption of lime salts) of the bony skeleton, with deformity ; occurs chiefly in pregnant women in early middle life.

**Symptoms.**—Obscure pain, multiple fractures or bending of the bones. Progressive exhaustion.

**Treatment.**—Stimulative and supportive. Opium for the pain ; alum and phosphorus. Oöphorectomy has been done with reported benefit.

**Prognosis.**—Unfavorable.

### ATROPHY.

Atrophy of bone occurs as—(1) Senile change ; (2) after fractures or contusions ; (3) disuse.

**Treatment.**—Femur a common seat ; counterbalance effects by means of high-soled shoe ; massage ; constitutional treatment.

**Prognosis.**—Guarded.

### HYPERTROPHY.

Hypertrophy occurs as—(1) Acromegaly (Marie's disease) —symmetric enlargement of face, hands, and feet ; (2) exostoses—homologous outgrowths ; (3) periostosis (inflammatory).

**Treatment.**—Seldom required. Palliative ; operation.

**Prognosis.**—Guarded.

### TUMORS.

Tumors take the form of—(A) Benign—fibromata, chondromata, osteomata. (B) Malignant—sarcomata (common, primary), carcinomata (rare, always secondary).

**Symptoms.**—Benign : Chondromata most common form ;



occur upon the long bones of the extremities, hands, and feet; are painless except when causing pressure or from bulk; are inelastic, attached by broad base, and are of slow growth. *Malignant* (Fig. 140): Constant pain (sometimes absent); spindle or pear-shaped swelling of the limb, increased heat (due to rapid growth of the part); growth, early is hard, later softens; exploratory puncture demonstrates free bleeding; may pulsate; crackling on pressure (*spina ventosa*).

**Treatment.**—Benign growths calling for treatment from bulk or disability: Remove by scraping, use of the gouge, curet, or chisel, with more or less of the surrounding bone. Malignant growths call for removal of the bone or amputa-



FIG. 140.—Osteosarcoma of the femur.

tion (at the hip or shoulder when extremities are involved) at the earliest possible moment after the diagnosis has been made.

**Prognosis.**—Good for benign growths; usually fatal in malignant ones.

## FRACTURES.

**Definition.**—A fracture is a solution of the continuity of a bone.

**Etiology.**—(A) Predisposing: (*a*) Anatomic relation (as, for example, the clavicle is more liable to fracture than the scapula); (*b*) function (bones of the extremities are more liable to fracture than those of the spinal column); (*c*) age (no age is exempt, but old people are most liable); (*d*) sex

(males); (*e*) right side; (*f*) diathesis (rheumatism, gout, tuberculosis, syphilis, alcoholism); (*g*) insanity; (*h*) tumor.

(B) Exciting: (*a*) External violence; direct (is usually associated with more or less wounding of the overlying soft parts, as in gunshot); indirect (the overlying soft parts are usually but little injured, as after a fall). (*b*) Muscular violence.



FIG. 141.—Comminuted fracture of the lower extremity of radius.

**Morphology.**—(A) Simple (closed fracture) consists of but two fragments and has no communication with the external air. (B) Compound (open fracture) communicates with the exterior by an open wound in the soft parts. (C) Comminuted (in which there are more than two fragments communicating) (Fig. 141).

(D) Complete (a fracture involving the entire thickness of the bone) may be: (*a*) Oblique (Fig. 142*d*); (*b*) longitudinal (Fig. 143); (*c*) transverse (Fig. 142*a*); (*d*) T or V-shaped (Fig. 144); (*e*) toothed (Fig. 145).

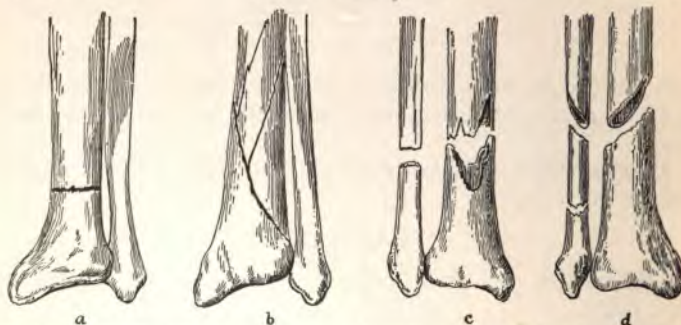


FIG. 142.—Complete fractures: *a*, Transverse; *b*, spiral; *c*, dentated; *d*, oblique or multiple.

(E) Incomplete (consisting of but a partial separation of the bony fibers) may be: (*a*) Fissured (split); (*b*) punctured (perforated); (*c*) indented. (F) According to the seat of the

fracture with relation to the bone affected or a nearby joint the fracture may be: (a) *Bone* (the fracture may be at the shaft, neck, condyle, tuberosity, or separation of the epiphysis (Fig. 146)—may have taken place before complete ossification). This last mentioned is to be diagnosed by a study of its relation to the joint. Joint motions will be found not to be involved. Growth of the bone is impeded and great



FIG. 143.—Longitudinal fissure of the humerus (after Forriep).

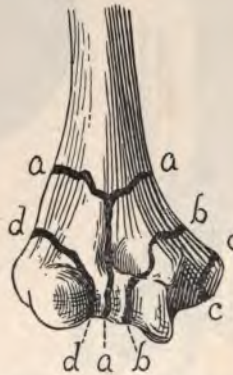


FIG. 144.—T-fracture, high (a, a, a). Fracture of internal condyle (b, b). Fracture of internal epicondyle (c, c). Fracture of external condyle (d, d) (diagram) (Scudder).

deformity results commonly from these injuries; separation of splinter (scaling) with tendinous attachment (this is known as separation of the apophysis). (b) *With relation to neighboring joints*: Intracapsular (those extending within the borders of the joint capsule) refers particularly to fractures of the femur and humerus; intra-articular (extending into a joint). (G) According to condition and number, fractures



are: Comminuted, impacted (the fragments are jammed) (Fig. 147), complicated (in which the fracture is accompanied by some additional injury to the same part). Fractures may be attended with deformity or displacement (may be angular, rotary, transverse (due to overlapping or overriding).

**Repair of Fractured Bones.**—Traumatic irritation gives rise to the formation of an encircling, ensheathing, or ring callus (consists of new bone-formation arising from the torn edges of the periosteum). Solidification of the marrow

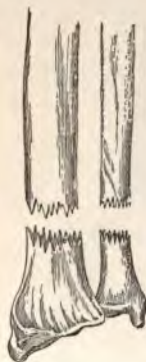


FIG. 145.—Appearances of the ends of fragments.



FIG. 146.—Separation of the upper epiphysis of the humerus. Displacement forward of the lower fragment (Moore).

takes place, forming the pin or interior callus. Permanent union between the ends of the fragments results by a formation of the intermediate or permanent callus, accompanied by partial absorption of the ensheathing callus, with tunneling of the pin callus to reform the medulla (Fig. 148).

**Symptomatology.**—(1) Deformity (displacement) is due to: (*a*) Fracturing force; (*b*) muscular action; (*c*) weight of the limb below the seat of the fracture; (*d*) elasticity. (2) Mobility (abnormal movement); may be absent

or difficult to detect in impaction, when the seat of fracture is near a joint, in the lower leg or forearm. (3) Crepitus (grating); may be absent in partial or impacted fractures. (4) Pain and tenderness. (5) Muscular spasm. (6) Numbness. (7) Extravasation. (8) Loss of function (may be impaired or complete).

**Diagnosis.**—Carefully uncover the part (cutting or ripping up the clothing). Diagnose from the history, deform-



FIG. 147.—Impacted fracture of the tuberosities of the humerus (Bardenheuer).



FIG. 148.—Repair of fracture of a rachitic humerus (longitudinal section): *a*, Compacta surrounding medullary canal; *b*, callus mass composed of spongy bone tissue; *c*, obliteration of medullary canal by displacement of compacta fractured on concave side, and by callus formation, which is most marked on concave side (after Gurli).

ity, abnormal mobility, crepitus, or by determination of the line of the fracture; make a comparison with the opposite side of the patient's body. Employment of anesthesia. In case of doubt, treat as though positive of the presence of fracture. X-ray.

**Complications and Sequelæ.**—(*a*) Rupture of the main artery (from stretching or puncture); (*b*) embolism (due to fat or detached blood-clot); (*c*) paralysis (from pressure or entanglement of nerve-fiber); (*d*) painful callus (due to excessive growth); (*e*) ankylosis (stiffness from non-use or displaced bone fragments locking an adjacent joint); (*f*) infection; (*g*) false joint (may be due to delayed or non-union, fibrous union); (*h*) gangrene (due to embolism, tight bandaging).

**Treatment.**—Temporary or provisional dressing: Immobilize by placing the injured limb or parts in as natural a position and with as little disturbance of the patient as possible. Employ for this purpose handkerchief, sheet, or clothing slings. Splints may be improvised from canes, lath, shingles, umbrellas, guns, bayonets, swords or scabbards, tree branches, straw, pillows, bark, grass.

**Skull.**—Apply a bandage; secure a litter.

**Jaw (Upper or Lower).**—Apply a compress under the chin, handkerchief over the head; unaffected jaw acts as a splint.

**Collar-bone or Shoulder-blade.**—Tighten the clothing by means of pins or bandaging; apply a sling to the forearm of the affected side.

**Arm (Upper).**—Bind to body or apply two splints, sling the forearm.

**Forearm.**—Apply a broad sling; apply a splint to the back of the arm (have the thumb up).

**Leg and Thigh.**—Apply a long splint extending from the armpit to below the sole of the foot; internal splint. Bind the injured limb to the sound one. Litter.

**Ribs; Sternum.**—Tighten the clothing, apply broad band bandaging.

**Spinal Column; Pelvis.**—Tighten the clothing (pinning and bandaging); bind the legs together; apply long lateral splints (armpits to feet). Litter (board, shutter, bench, mattress—hard).

**Permanent Dressing and Treatment.**—Reduce (set) the fragments to a normal position as soon as practicable. Employ extension, counterextension, manipulations. Secure relaxation when necessary by use of general anesthesia.



**Fracture-bed** should consist of a firm mattress (for use in fracture of the trunk, skull, thighs).

*Splints* padded with cotton-batting, oakum, wool, or hair may be constructed from white pine, poplar, or willow wood,  $\frac{1}{8}$  to  $\frac{1}{2}$  inch (3–12 mm.) in thickness, cut to measured length and width; they may be of pasteboard or binder's board, molded to shape by soaking in boiling water, or of raw-hide similarly worked; of felt; plaster of Paris; starch (dissolved in cold water, after which boiling water is added until the proper consistence is secured) requires from twelve to forty-eight hours to dry thoroughly (Fig. 149); gum and chalk

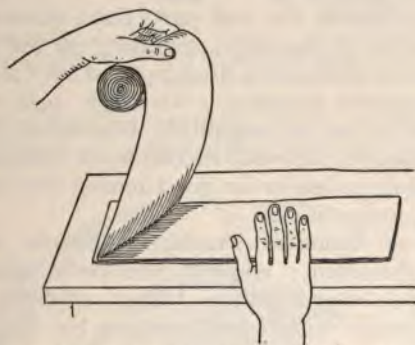


FIG. 149.—Splint made from plaster-of-Paris bandage. Complete by molding to the part; trim after setting has taken place.

(gum arabic and precipitated chalk, add sufficient boiling water, stirring, to obtain a proper consistence of solution), applied upon bandages; hatter's felt or binder's board may be softened in hot water and molded to the injured parts. The *coaptation splint* consists of thin and narrow board strips (of bass wood or pine) placed in position (side by side, with a slight interval) upon a sheet of adhesive plaster, or they may be quilted between two pieces of sheeting. The splint is held in position by bandaging or by adhesive straps, and may be employed in emergency or to reinforce the ordinary board or bracket splint. *Fracture-box* consists of a stout board 6 to 8 inches (15–20 cm.) wide by 18 to 30 inches (45–75

cm.) long, with hinged sides, a foot-board, upright, firmly attached at right angles to the bottom board, padded with a pillow, cotton-batting, or bran; may be used in treating fractures of the lower leg and knee. Bags made from stout muslin or light duck canvas cut 14 inches (35 cm.) wide by 3 feet (90 cm.) to 5 feet (1.5 m.) long, doubled, sewed, and inverted before filling with sand or bran, closed with a draw-string or by stitching, are employed in fractures of the leg and thigh. *Compresses* to prevent displacement may be made of cotton, lint (folded), oakum, and held in place by adhesive straps, bandage, or placed upon splints when padding.

Prevent infection of the soft parts from maceration of the skin surfaces by a thorough cleansing of the part before applying the first permanent dressing and by "alcohol rubs" at each subsequent dressing. Neuralgic pain in the parts after fracture is due to organized blood-clot or exudate. Treat by massage. Avoid meddlesome surgery by not changing dressings unless for good reason (swelling, loosening, infection, malposition).

**Treatment of Ununited Fractures.**—Secure an accurate, immovable adjustment; employ orthopedic splints; stimulate union by counter-irritation, blister, cautery, electricity; manipulation under anesthesia; drilling the fragments, wiring, bone splints (metal plate with screw rivets); resection; bone-transplantation. After-treatment important: secure careful, rigid splinting; give tonics and stimulants.

**Treatment of Compound Fractures.**—Antiseptically, closing or draining the wound in the soft parts.

### SPECIAL FRACTURES.

**Skull.**—Vault (arch) occurs usually by direct violence or by *contre-coup* (counterstroke), transmission of the fracturing force beyond the point of impact.

**Morphology.**—Simple or compound: (*a*) Without displacement (fissured—Fig. 150); comminuted (Fig. 151); (*b*) with displacement (depressed, elevated; with or without impaction).



FIG. 150.—Isolated fissure of the skull, caused by a fall upon the head. The fissure crosses the coronary fissure, and involves the occipital, parietal, and frontal bones (after Bruns).

**Symptoms.**—None for simple, linear, or fissured variety unless an effusion of cerebrospinal fluid takes place beneath



FIG. 151.—Comminuted fracture of the skull (Hoffa).

the scalp (a condition called traumatic cephalhydrocele) with symptoms of compression. *Pott's sign* (puffy tumor of Pott), consists of the presence of a fluctuating mass under



the scalp, due to rupture of the dura and escape of cerebrospinal fluid.

**Base of Skull.**—May be the result of *contre-coup* (due either to bursting force or to molecular transmission).

**Symptoms.**—(1) Anterior fossa: Loss of smell; escape of cerebrospinal fluid or hemorrhage from the nose; intra-orbital ecchymosis (unaccompanied by contusion of subcutaneous tissues). (2) Middle fossa: Loss of hearing; escape of cerebrospinal fluid or blood from the ear; pulsation of fluid in the external auditory canal (quantity of fluid may increase by coughing, sneezing, by having patient hold his breath, or by making pressure on the jugular veins). By chemic analysis distinguish cerebrospinal fluid from endolymph and serous exudate, also by estimating amount escaping. Cerebrospinal fluid is clear, limpid, unclouded, watery, alkaline in reaction, having a salty taste, specific gravity of 1020, reaction to tests for both albumin and sugar occur. Microscopically find a clear fluid containing a few granular cellular elements floating free. (3) Posterior fossa: A tumor presents in the roof of the pharynx; ecchymosis occurs at the back of the neck and roots of the hair, appearing first in front of the mastoid process.

**Complications.**—Hemorrhage, pressure paralysis, infection, wounding of the brain or meninges, hernia cerebri (protrusion of softened brain-mass through the fractured bone cleft).

**Treatment.**—*In fracture of the vault*, when simple, without depression or compression, in which cerebral symptoms are improving, treat expectantly. *Local*: Ice-cap cold-water coil. *General*: Enforced rest, purgation—calomel gr.  $\frac{1}{8}$  to  $\frac{1}{4}$  (0.008–0.016 gm.) q. s.; Epsom salts,  $\mathfrak{z}$  ij to  $\mathfrak{z}$  iv (8–128 gm.); Rochelle salts,  $\mathfrak{z}$  ij to  $\mathfrak{z}$  iv (8–128 gm.). In depressed fracture, whether simple or compound, trephine (preventive). Trephine in fractures of the vault; therefore when symptoms of depression or continued compression are present. *Fracture of the base*: treat by absolute rest, purgation, cold to the head and back of the neck; secure careful asepsis, so far as possible, of nasal, buccal, pharyngeal, and auditory passages by means of weak potassium permanganate (1:5000); boric-acid (1:500) solutions. *Fracture of the*

*roof of the orbit* may be reached by the trephine and drained. The *middle fossa* may be reached by trephining above and behind the external auditory meatus.

**Prognosis.**—Always grave. Fracture of the posterior fossa is twice as fatal as fracture in either anterior or middle fossæ.

**Bones of the Face.**—These fractures occur as a result of direct violence, falls, gunshot, blows.

**Malar Bone.**—Depression may be overcome by manipulation or by passing a stout silk suture by means of curved needle behind the depressed (zygoma) portion, and making traction (tenaculum used as a lever). Dress antiseptically if compound, retain by compress or a bridge splint, adhesive straps, and bandage. Recovery occurs in about two weeks.

**Superior Maxilla.**—Due to direct violence. Correct displacement by manipulation and retain by adhesive plaster and bandage. Careful frequent disinfection of the mouth cavity (use hydrogen dioxid, weak potassium permanganate, or boric-acid solutions). If the alveolar process is involved, retain it in place by interdental splints, wiring, or by bandaging the lower jaw firmly against the upper. Employ nasal or mouth-tube feeding. Repair occurs in from three to seven weeks.

**Nasal Bones.**—Follow blows or falls; are accompanied by rapid swelling, which often makes detection of the fracture difficult. Involvement of the superior maxilla or cribriform plate of the ethmoid frequently occurs.

**Treatment.**—Replace by manipulation of fingers, counter-pressure with a probe or grooved director within the nose (render field sterile by douching and cocainize before commencing). Depression may be overcome by packing gauze about a piece of rubber tubing or catheter, so as not to interfere with breathing; nasal splints; external lateral compresses held by adhesive strips; transfixion by pins, which are to be left in seven to ten days. Careful attention to cleansing the nasal cavity should be given (hydrogen-dioxid spray; boric-acid or potassium-permanganate (weak) solutions). Except in the presence of caries, results are usually good.



**Frontal Bones.**—Fracture into frontal sinus follows direct violence, with or without brain injury. Emphysema of surrounding soft parts from escaping air from the nose may occur.

**Treatment.**—Elevate if depression is present; apply gauze dressing and adhesive strapping. Repair occurs in from three to five weeks. Fistulous tract, if left behind, calls for subsequent plastic operation.

**Lower Maxilla.**—The commonest fracture of bones of the face. Occurs from direct violence upon the chin or cheek. When single, the commonest site is at symphysis or mental foramen. Displacement. Jaw is turned toward the affected side (in dislocation the jaw is turned away from the affected side), and is manifested by a difference in the level of the teeth upon the two sides (may be both felt and seen). The diagnosis is made by noting loosening of the teeth, with bleeding from the gums, increased mobility, and crepitus.

**Treatment.**—Replacement by manipulation; secure by the use of a molded pasteboard chin-splint held in place by a four-tailed bandage or Barton's bandage; if compound, mouth must be frequently cleansed. Wiring; interdental splints.

**Prognosis.**—Usually good; prompt recovery (two to six weeks unless caries or necrosis with sinus formation takes place).

**Hyoid Bone.**—Rare; caused by muscular action, hanging, strangling. Gives rise to rapid swelling, dysphagia, bleeding into the mouth.

**Treatment.**—Prevent cough, secure enforced rest. Reduce (greater cornua is part most often affected) by manipulation externally and within the mouth. Retain by means of adhesive straps and pasteboard collar. Death has occurred from rapid edema of the glottis.

**Vertebra.**—Due to forced flexion or direct violence. Always serious, owing to possible involvement of the spinal cord, membranes, or nerves. Greatest care is needed in handling. Place patient on his back upon a hair mattress or water- or air-bag. If doing well, treat expectantly; abso-



lute rest and quiet. Reduce deformity or pressure paralysis by manipulation, palpation through the mouth (in cervical fracture). Determine the nature of the accident and the seat of lesion by palpation and history.

**Symptoms.**—Shock, pain, tenderness, ecchymosis, angular deformity, crepitus, phosphatic urine, priapism, anesthesia, and retention or incontinence of urine and feces. \*In fracture of atlas or axis there is complete paralysis below, and pain in occiput and neck; head fixed. If unilateral, displacement occurs; head turned to opposite side; sometimes undue prominence of pharynx and larynx.

**Treatment.**—Careful attention to bladder and bowel movements; pass soft catheter every six hours. Extension, counterextension, plaster cast, resections; prevent movement of the head by sand-bags and plaster cast; trephine (in partial lesions or when low down). Avoid bed-sores by cleanliness and stimulation of the skin (daily alcohol rubbing).

**Prognosis.**—Guarded. If the patient survives early days or weeks, may hope for recovery with various forms of functional disability.

**Sternum.**—Result of direct or indirect violence or from muscular action. When separation between the bones takes place (diastasis), the posterior ligament remains unruptured; lower fragment rises anterior to the upper portion. In true fracture the lower fragment is posterior to the upper; crepitus; seat of fracture is below the junction of *gladiolus* and *manubrium*.

**Complications** are: Hemorrhage; puncture of the pleura and pericardium; mediastinal abscess.

**Treatment.**—Determine presence of congenital malformations from the history. Reduce by manipulation; apply retention compress, held on by broad, adhesive straps. Posterior figure-of-eight bandage of the shoulder.

**Prognosis.**—Favorable in uncomplicated cases. Union takes place in from three to five weeks.

**Ribs.**—Occur from direct or indirect violence or muscular action (childbirth, coughing). Fourth to tenth ribs most often affected. Seats: At the angle or near the junction of costal cartilages.

**Symptoms.**—Pain (stitch) upon forced respiratory movement; crepitus; deformity; mobility.

**Complications.**—Emphysema, hemorrhage.

**Treatment.**—Firmly strapping the affected rib or ribs with from four to six overlapping layers of adhesive strips, 1 to 2 inches (2.5–5 cm.) wide, extending from the sternum to beyond the middle of the back, and applied above and below for the distance of two ribs.

**Method.**—Apply each strap at the end of a forcible expiration. Treat a depressed fracture (puncturing the lung) by passing a curved needle threaded with strong silk around the rib subcutaneously (by which the depressed fragment may be drawn outward into proper position, strapping to retain).

**Prognosis.**—Favorable. Three to five weeks are required for repair.

**Costal Cartilages.**—Fracture occurs as a result of great violence, and is usually complicated by great injury to viscera and soft parts. Union results in bone-formation in from three to four weeks.

**Treatment.**—Firm strapping.

**Prognosis.**—Good.

**Pelvis.**—Serious, owing to the accompanying visceral injuries.

**Symptoms.**—Pain (increased by standing or walking); crepitus; mobility (patient feels as though falling apart); shock.

**Complications.**—Hemorrhage, peritonitis, extravasation; rupture of the bladder or of the deep urethra.

**Treatment.**—Absolute rest (patient upon his back); reduce by manipulation; secure retention by plaster cast, broad, encircling, adhesive straps; sand-bags, as for fracture of the thigh. Support and flex knees upon pillows. May employ gas-pipe bed-frame. Wiring of the fragments if comminution has occurred.

**Prognosis.**—Guarded. Recovery in three to five weeks if uncomplicated.

**Sacrum and Coccyx.**—Result of direct violence and associated with visceral injury.



**Treatment.**—Reduce by manipulation and retain by means of adhesive straps and binder.

Fracture of the coccyx may involve nerve filaments, giving rise to a neuralgic condition (coccygodynia) requiring excision of the fractured portion of the bone.

**Prognosis.**—Guarded.

**Clavicle.**—Fracture due to direct violence at any point; indirect violence (falls or blows upon the shoulder) occurs usually at the middle third.

Partial (green-stick) fracture gives rise to angular deformity (depression) at about the middle of the bone.

Muscular action (clavicle bent upon the first rib acting as a fulcrum).

**Symptoms.**—Attitude (drooped shoulder; arm upon affected side supported by the other); mobility; crepitus; deformity.

**Complications.**—Emphysema; hemorrhage.

**Treatment.**—Reduce by manipulation with fingers or by pressure of operator's knee beneath patient's shoulders. Secure retention; patient in bed flat upon his back (no pillow); shot-bag upon the affected side. Compress to seat of fracture held on by adhesive strap; posterior figure-of-eight bandage; support forearm in a sling. Place hand and arm in Velpeau position; retain by two broad adhesive straps (Sayre dressing). Velpeau position retained by single broad adhesive strap; bandaging (third roller of Desault). Prevent maceration of the skin-surfaces by gauze, towel, and dusting-powder (starch, talcum). In children stitch dressings or reinforce by adhesive strips.

**After-treatment.**—Sling the arm of the affected side for three or four weeks after removing fracture dressing.

**Prognosis.**—Favorable for union in three to six weeks. Deformity is common.

**Scapula.**—Fracture may occur in body; acromion or coracoid processes of the bone.

**Symptoms.**—Pain (muscular spasm); crepitus; mobility; deformity.

**Treatment.**—Reduce by manipulation. Secure retention by immobilization of the arm to the side (padding the axilla);



forearm in a sling. Velpeau position retained by means of Velpeau bandage. Anterior and posterior figure-of-eight bandages (firmly applied). Plaster cast.

**Prognosis.**—Recovery in from three to five weeks. Stiffness and deformity of the shoulder may follow.

**Humerus.—Morphology.**—(A) Upper extremity: (*a*) Head and anatomic neck (rare); chiefly intracapsular. Detachment of bone fragment may occur, it becoming loose in the joint; (*b*) through the tubercles (completely extracapsular); (*c*) longitudinal (splitting off of the greater tuberosity); (*d*) surgical neck and separation of the epiphysis (commonest form).

**Symptoms.**—Though the head and anatomic neck have slight shortening with crepitus, there is but little or no deformity or interference with motion.

(A) **Fracture through the Tubercles.** Symptoms are often obscure. Longitudinal: crepitus; increase in anteroposterior diameter. Surgical neck or separation of the epiphysis: crepitus; deformity (overriding); mobility.

**Treatment.**—Reduce the deformity; retain by compresses, padded shoulder-cap (molded pasteboard or plaster of Paris) held on by adhesive straps; levelling pad in axilla; arm fastened to the side; forearm supported at the wrist (counter-extension) by a sling (primary roller of hand and arm to the seat of fracture). Padded wooden (measured to size) triangle, fastened to chest and arm (from axilla to elbow) by means of adhesive plaster straps and bandages. Velpeau position with Velpeau bandage dressing. Dislocation of the head of the bone may complicate. Employ passive motion about second or third week. Operation (resection, wiring).

**Prognosis.**—Usually favorable. Deformity at times, but seldom have a permanent disability. Union occurs in from three to six weeks.

(B) **Fracture of the Shaft.**—Usually follows a twisting force or from direct violence.

**Symptoms.**—Pain; deformity (shortening, overriding, swelling); crepitus; mobility; wrist-drop (paralysis of musculospiral nerve).

**Treatment.**—Primary roller bandage applied to hand, arm,

to seat of fracture. Short interval splint (avoid pressure upon axillary vein); padded shoulder-cap and long external splint (molded); arm fastened to side of chest, levelling pad and bandages. Support forearm by slinging from the wrist (counterextension); vary the length of the sling (overcome stiffness at the elbow). Triangle splint. Plaster cast.

*Prognosis.*—Union commonly occurs in from four to six weeks. Atrophy of muscles, temporary ankylosis of shoulder and elbow, and non-union are common.

**(C) Fracture of Lower Extremity.—(a) At Base of Condyles.**

—*Symptoms.*—Pain, swelling, ecchymosis, crepitus, deformity (recurrence after replacement unless immobilized).

**(b) At Base of Condyles with Splitting Between.—Symptoms.**—Pain, swelling, crepitus, deformity (displacement and widening). Diagnosis may be furthered by the application of an Esmarch bandage (removes edema); x-ray, anesthesia.

*Complication.*—Dislocation of both bones of the forearm.

*Treatment.*—Employ a thinly padded, internal, right-angled splint until the swelling begins to subside. Posterior molded right-angled splint; plaster-of-Paris cast (arm flexed to a right angle). Forearm acutely flexed, retained by a broad adhesive plaster band.

*Precautions.*—Degree of flexion obtainable depends upon amount of swelling, pain, blood-vessel compression. Prevent chafing by the application of dusting-powder, gauze cloth. Begin a careful passive motion from the fourth to sixth week.

*After-treatment.*—Massage; functional activity; hot fomentations; dry, hot air.

*Prognosis.*—Guarded. Union takes place in from four to ten weeks. Degree of function obtained depends upon care during treatment and subsequently.

**Ulna.—(a) Olecranon.**—Follows direct violence (fall), indirect violence (fall upon the hand), or muscular action (forcible contraction of triceps extensor).

*Symptoms.*—May be slight; mobility; deformity ("three points" not in line).

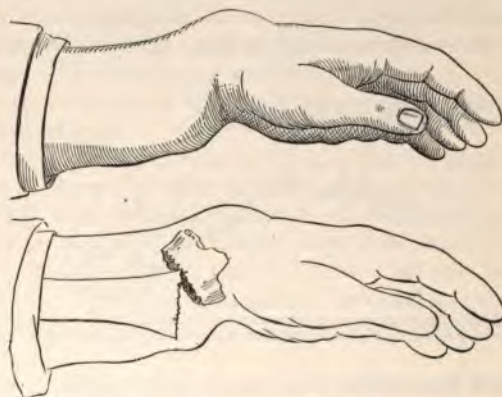
*Treatment.*—If the fragment is held by means of a periosteal attachment, apply small compress held by adhesive

splints may be applied over compresses and retained by adhesive strap and bandage, slinging the forearm from the wrist (thumb side up with hand pendant—abduction). Single long posterior splint (gauze compresses at seat of fracture); hand flexed (cotton compress) and abducted.

*After-treatment.*—Regain functional activity by massage; hot fomentations; hot, dry-air applications (baking).

*Prognosis.*—Guarded. Union usually in from four to eight weeks.

**Fracture of Both Bones (Ulna and Radius).**—May be due to direct or indirect violence. When partial (green-



FIGS. 153, 154.—Deformity at the wrist, consequent upon displacement backward of the lower fragment of the radius after fracture at its lower extremity (Levis).

stick), deformity, with associated pain, swelling, and tenderness, are the chief symptoms.

**Treatment.**—Reduction may require anesthesia and refracture. Secure retention by anterior and posterior splints. Arm flexed to right angle and midway between pronation and supination. Sling.

Complete fracture is manifested by greater deformity, crepitus, pain, swelling, mobility ("flail joint").

**Treatment.**—Reduction by manipulation. Secure retention of arm flexed at right angles and midway between



pronation and supination. Anterior and posterior splints, reinforced by internal angular splint (axilla to wrist). Plaster-of-Paris-bandage dressing.

**Prognosis.**—Guarded. Union occurs in from four to eight weeks.

**Carpal.**—Follow direct violence (compound fracture) or indirect violence with accompanying dislocations.

**Symptoms.**—Pain, crepitus, deformity. X-ray will further diagnosis.

**Treatment.**—Reduction by manipulation (anesthesia may be required); secure retention by long dorsal or long palmar splints; plaster of Paris. Subsequent excision may be required. Sling.

**Prognosis.**—Guarded. Union in uncomplicated cases will take place in from two to four weeks.

**Metacarpal.**—Due to direct or indirect violence.

**Symptoms.**—Pain, crepitus, deformity (swelling, displacement, local tenderness).

**Treatment.**—Reduction by manipulation; secure retention by dorsal or palmar splints. Roller-bandage or ball grasped in the palm and held by adhesive straps and bandage. Sling.

**Prognosis.**—Favorable. Union occurs in from one to four weeks.

**Phalanges.**—Occurs from direct or indirect violence.

**Symptoms.**—Pain, crepitus, deformity.

**Treatment.**—Reduce by manipulation; retain by anterior and posterior (long) finger splints. Roller-bandage or ball dressing.

**Prognosis.**—Favorable. Recovery in two to four weeks.

**Femur.**—(A) **Upper Extremity.**—Includes fracture of the neck within the capsule (intracapsular), fracture of the neck without the capsule (extracapsular), partly intracapsular and partly extracapsular; at the base of the neck through the great trochanter; through the epiphysis (rare).

**Etiology.**—Predisposing: female sex, old age. Active: direct or indirect violence.

**Symptoms.**—Less marked when impaction has taken place. Deformity; alteration in the shape of the hip (flattening); wrinkling of the fascia lata when in the erect posture (Allis's

sign); pain and tenderness, increased on movement; crepitus, manifested by rotating the limb (if not impacted); loss of function (usually complete); shortening, with eversion of the foot (measure from the point of the anterior superior spines of the ilium to the tuberosity of the ischium—Nélaton's line). Elevation may likewise be demonstrated by drawing perpendicular lines from the anterior superior spines of the ilium, and the distance from the tips of the trochanters to these lines being measured, it will be found shorter upon the fractured side (Bryant's line).

*Treatment.*—As patients are sometimes enabled to get up and walk after these fractures, careful examination (*x-ray*) is necessary. Doubtful cases should be treated expectantly for a few days (to avoid law-suits for malpractice).

*Local.*—Reduce by manipulation; employ straight position with sand-bags (long). Long straight splints, with three to five pounds weight extension (to overcome muscular spasm). Buck's stirrup. Adhesive plaster band is cut 3 inches (7.5 cm.) wide and 4 feet (1.2 m.) long. On the middle is placed a block of wood, cut as wide as the plaster band, 4 inches (10 cm.) long and  $\frac{1}{2}$  inch (1.25 cm.) thick; over this is laid another plaster band of similar width, but 2 feet (60 cm.) in length. Attached to the lower leg from just below the knee adhesion takes place to just above the malleoli, leaving the block suspended below the sole of the foot. Fixation is secured by three or four circular straps and a bandage. To prevent chafing, the malleoli should be protected by cotton and the weight should not be applied until several hours after the application of the apparatus. The weight (5 to 12 pounds—2.5–6.1 kilos) is attached by a cord playing over a pulley fixed upon the footboard of the bed. Counterextension is made by means of perineal or shoulder bands or by elevation of the foot of the bed. Plaster-of-Paris dressing.

*General.*—Supportive and stimulative. In the aged seek to get the patient up early, even at the expense of non-union of the fracture (see Fig. 155).

*Prognosis.*—Always guarded. Some disability always remains. Union may take place in from eight to twelve weeks.

(B) **Shaft.**—Follows direct violence.

*Symptoms.*—Deformity; shortening, overriding, anterior angular projection; crepitus; pain; swelling, knee-joint effusion (blood); loss of function; eversion.

*Treatment.*—Reduce by manipulation; anesthesia may be required. Secure retention by Buck's stirrup extension (Figs. 156-158); counter-extension by elevation of the foot of the bed; fixation by long splints and sand-bags. A short anterior splint may be required for anterior angular deformity. Double-inclined plane (when seat of fracture is below the upper third of the bone). Triangle splint (Fig. 159); may apply weight extension in addition (in general apply a pound for every year of life up to twenty). Plaster of Paris.

Fracture of upper third of femur with drawing up of upper fragment may be dressed in a drawn-up position of



FIG. 155.—Ambulatory fracture splint.

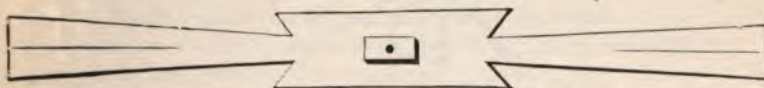


FIG. 156.—Adhesive plaster cut for Buck's extension (Stimson).

the leg (flexed). Adult may rest upon his side; in a child, both legs fastened together and drawn up.

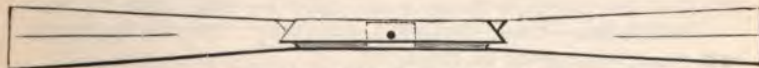


FIG. 157.—Adhesive plaster folded for Buck's extension (Stimson).

*Prognosis.*—Guarded. Shortening always present. Union in from eight to twelve weeks.

(C) **Lower Extremity.**—Due to direct or indirect violence.



May take the form of—(a) Supracondylar; (b) intercondylar; (c) fracture of a condyle; (d) separation of the epiphysis.

*Symptoms.*—Pain, tenderness, swelling; crepitus; mobility; loss of function.

*Treatment.*—Plaster of Paris. Double-inclined plane. Long fracture-box.

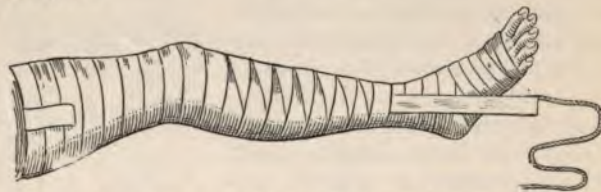


FIG. 158.—Adhesive plaster applied to make extension.

*Prognosis.*—Guarded. Union in from eight to twelve weeks.

**Patella.**—Occurs in adult males. Follows direct violence (comminuted or longitudinal) or muscular action—breaks as an overbent lever (commonly transverse).



FIG. 159.—Application of triangular splint dressing for fracture of the thigh in children.

*Symptoms.*—Pain, swelling; deformity, retraction; mobility; crepitus; loss of function.

*Treatment.*—Secure retention by broad adhesive-plaster band applied above and below, cut and fitted over the patella with strap and buckle; posterior splint or fracture-box. Posterior straight splint with retention straps passing from above the seat of fracture, diagonally across and downward;

from below upward and across the site of fracture. Open operation (is best performed after the third or fourth day, when the swelling has subsided and bone hemorrhage has ceased); remove blood-clots from between the fragments and suture the torn capsule with catgut, suturing the fragments (silver wire or silk); dressing applied with leg in extension. Plaster of Paris.

**After-treatment.**—Protection for three to six weeks by means of a leather or elastic cap.

**Prognosis.**—Guarded. Most favorable results are obtained by open operations, but the danger of joint infection is ever present. Time required for union is about six weeks.

**Tibia.**—(A) **Upper End.**—Occurs as a result of direct or indirect violence. May be accompanied by fracture or dislocation of the fibula; separation of the epiphysis.

**Symptoms.**—Pain and tenderness; swelling (when knee-joint is involved, seriousness of condition increased); mobility; displacement slight if fibula is uninjured.

**Treatment.**—Extension (Buck's stirrup); long fracture-box; anterior angular splint; lateral splints; plaster-of-Paris-bandage dressing after swelling has subsided.

**Prognosis.**—Favorable if uncomplicated; union occurs in from six to ten weeks.

(B) **Shaft.**—Follows direct or indirect violence.

**Symptoms.**—Pain, tenderness, swelling; crepitus; deformity; mobility; impaired function.

**Treatment.**—Lateral splints with short anterior splint if needed for correction of angular deformity. Plaster-of-Paris-bandage dressing. Fracture-box.

**Prognosis.**—Favorable. Union takes place in from six to ten weeks.

(C) **Lower End.**—Occurs as a result of direct or indirect violence.

**Symptoms.**—Pain, swelling; crepitus; deformity; mobility.

**Treatment.**—Fracture-box. Carefully avoid—(a) pointed toe deformity; (b) external rotation; (c) points of excoriation; (d) see that the prominences, base of the big toe, the internal malleolus and the inner condyle at the knee, are in line. Plaster-of-Paris-bandage dressing.

*Prognosis.*—Guarded. Union in from seven to ten weeks.

**Fibula.**—(A) **Upper End.**—Follows direct or indirect violence; may be accompanied by fracture or dislocation of the tibia.

*Symptoms.*—Pain, swelling, tenderness; crepitus; mobility; deformity (usually little or no displacement unless tibia is involved).

*Treatment.*—Fracture-box. Plaster-of-Paris-bandage dressing.

*Prognosis.*—Good when uncomplicated. Union in from five to nine weeks.

(B) **Shaft.**—May follow muscular action or be due to direct or indirect violence.

*Symptoms.*—Pain, tenderness, swelling; crepitus; mobility; deformity (slight displacement unless tibia is involved).

*Treatment.*—Plaster-of-Paris-bandage dressing. Fracture-box. Molded lateral splints.

*Prognosis.*—Good when uncomplicated. Union in from five to nine weeks.

(C) **Lower End.**—Follows direct or indirect injury.

*Symptoms.*—Pain, swelling, tenderness; deformity; crepitus; mobility; impaired function.

*Treatment.*—Fracture-box. Plaster-of-Paris-bandage dressing or molded splints.

*Prognosis.*—Guarded. Union in from seven to ten weeks.

**Pott's Fracture.**—Occurs at the ankle; follows forcible abduction with eversion, or adduction and inversion. It is characterized by fracture of the fibula three inches from the tip of the malleolus; of the internal malleolus with rupture of the internal lateral and the tibiofibular ligaments; and of the outer lower edge of the tibia.

*Symptoms.*—Pain; swelling; tenderness (marked at the three points of fracture); loss of function; crepitus; deformity (outward) of the foot with prominence of the internal malleolus (Figs. 160, 161); mobility (widening of the ankle-joint).

*Treatment.*—Reduce displacement by manipulation. Retain by means of internal lateral splint extending below the foot (Dupuytren's splint) (Fig. 162), and holding the foot in



a position of adduction by the use of a wedge-shaped pad. Plaster-of-Paris-bandage dressing or molded splints. Fracture-box; Employ compresses—one upon the inner side



FIG. 160.—Pott's fracture, showing outward displacement.

above the inner malleolus, the other upon the outer side below the outer malleolus.



FIG. 161.—Pott's fracture, showing backward displacement.

*Prognosis.*—Guarded. Union in seven to twelve weeks.

**Calcaneum.**—May follow direct violence or muscular action.

**Symptoms.**—Pain; swelling; crepitus; retraction (when fragment attached to the tendo Achillis is involved).

**Treatment.**—If no displacement, reduce local swelling; fracture-box; plaster-of-Paris-bandage dressing. If retraction of fragments has taken place, reduce and retain leg in flexed position by means of plaster-of-Paris dressing; slipper with thigh band attachment; resection; wiring.

**After-treatment.**—Prevent stiffening of ankle-joint by massage (after second week).

**Prognosis.**—Favorable. Union in from four to seven weeks.

**Astragalus.**—May follow direct or indirect injury; may be complicated by dislocation of one of the fragments.



FIG. 162.—Dupuytren's splint in Pott's fracture.

**Symptoms.**—Obscure (pain, swelling, crepitus), except when dislocation of a fragment is present.

**Treatment.**—Immobilization of the foot by means of a plaster-of-Paris dressing. Excision (fragment or entire bone). Massage after second week.

**Prognosis.**—Guarded. Union in from three to six weeks.

**Metatarsals.**—Follows direct violence.

**Symptoms.**—Pain, swelling, tenderness; crepitus; mobility; deformity.

**Treatment.**—Plaster-of-Paris-bandage dressing after reduction. Plantar splints. Elevation (enforced rest).

**Prognosis.**—Good. Union in from three to four weeks.

**Phalanges.**—Follow direct injury.

**Symptoms.**—Pain, swelling; crepitus; deformity; mobility.

**Treatment.**—Dorsal splints. Plaster-of-Paris bandage.

**Prognosis.**—Favorable. Union in from three to four weeks.

**Bending of bone** accompanied by fracture occurs in—  
(a) Osteitis deformans; (b) osteomalacia; (c) rickets.

**Treatment.**—*Local.*—Orthopedic splints. Plaster-of-Paris-bandage dressing.

*Constitutional.*—Improve the hygiene; tonics.

**Prognosis.**—Guarded.

## CHAPTER XIV.

### ORTHOPEDIC SURGERY.

#### BOW-LEGS.

(*Genus varum*; *Genus extorsum*.)

**Definition.**—A deformity of the lower limbs characterized by an outward bowing of both femur and tibia or of the tibia alone, with at times an anterior bending of the latter bone (Fig. 163).

**Etiology.**—(1) Premature attempts at walking; (2) rickets (in the young); (3) osteitis deformans (in the adult).



FIG. 163.—Bow-legs.



FIG. 164.—Knock-knees.

**Pathology and Symptomatology.**—The weight of the body and muscular action gives rise to the bending of the softened bones. Inspection indicates the condition.



which is further proved by the rolling gait and turning of the feet.

**Treatment.**—Internal administration of iron, phosphorus, lime salts, with improved hygiene, sometimes aids in securing spontaneous correction of the deformity. Retention splints, braces, or plaster-of-Paris-bandage dressing will reduce the deformity if applied before the bones have become too firmly set. In severe cases in the young or when in the adult fracture or section (osteotomy) of the bone, resetting, and retaining in a good position by means of padded splints. Anterior curvature (Fig. 164) may disappear after enforced rest, or osteotomy and tenotomy (tendo Achillis) be required.

**Prognosis.**—Good.

### KNOCK-KNEES.

(*Genus valgum.*)

**Definition.**—A deformity of the knee-joints or shafts of the long bones of one or both legs, characterized by an abnormal inclination of the interarticular line, giving rise to a more or less close approximation of the knees with separation of the feet (Fig. 164).

**Morphology.**—One or both knees may be affected and be so slight as to cause no hindrance to locomotion, or so severe as to cause crossing of the knees and give rise to a wabbling gait. Flat-foot is often found associated.

**Etiology.**—Rickets. In poorly developed individuals occupation requiring long-continued standing.

**Pathology and Symptomatology.**—Relaxation of the ligaments and muscles about the joints occurs, allowing the articulation to yield inward and backward. The deformity is progressive from the time that the child begins to walk, or may not appear until after puberty.

**Treatment.**—In children and adolescents internal treatment: Iron, arsenic, cod-liver oil, strychnin, phosphorus, lime salts, with the improvement of hygienic conditions.

**Locally.**—Padded splints or braces will oftentimes prove effectual. In severe cases and in adults operative measures

will be required: (1) Excision of a V-shaped piece of bone from the femur, above the internal condyle (Chiene's operation); (2) incision two-thirds the way through the femur (subcutaneous), with fracture through the remainder of the bone (Macewen's supracondyloid osteotomy). Padded splints are applied or the limb is immobilized in a plaster-of-Paris-bandage dressing.

**Prognosis.**—Favorable. Spontaneous correction is uncommon.

### CLUB-FOOT.

(Talipes.)

**Definition.**—A progressive, congenital or acquired deformity of the foot, characterized by a permanent deviation in one or other of the lines of movement (Figs. 165–167).



FIG. 165.—Varieties of clubbed feet: *a*, Talipes equinus; *b*, talipes calcaneus; *c*, talipes cavus or arcuatus; *d*, talipes equinovaglus.

**Morphology.**—(1) Talipes equinus (extension) (Fig. 165 *a*); (2) talipes calcaneus (flexion) (Fig. 165 *b*); (3) talipes varus (adduction) (Fig. 166 *b*); (4) talipes valgus (abduction) (Fig. 166 *d*). Acquired club-foot most often takes the form of talipes equinus (elevation of the heel). The most frequent congenital variety is talipes varus (adduction), with elevation of the heel, which, when marked, is designated talipes equinovarus (Fig. 167).

**Etiology.**—1. *Congenital*: (*a*) Heredity; (*b*) uterine pressure causing persistence of fetal position of the foot; (*c*) intra-uterine disease, giving rise to paralysis and arrested development.

(2) *Acquired*: (a) Paralysis (disturbance of nervous system during dentition; irritation of intestinal worms; hysteria); (b) abscess or injury to calf of the leg; (c) faulty position after fracture.

**Pathology.**—*Congenital*.—Depends upon contraction and wasting of various muscles and tendons, with sometimes atrophy and distortion of the astragalus, scaphoid, and cuboid bones.

*Acquired*.—Besides contraction, the muscles undergo fatty degeneration.

**Symptoms.**—1. Talipes equinus manifested by elevation of the heel; may be so slight as merely to prevent the foot from being flexed beyond a right angle, or so marked as to force the patient to walk upon his toes and extremi-



FIG. 166.—Varieties of clubbed feet: *a*, Talipes equinovarus; *b*, talipes varus; *c*, talipes calcaneovarus; *d*, talipes valgus; *e*, talipes calcaneovalgus.

ties. Contraction of the arch of the foot unaccompanied by elevation of the heel is termed talipes arcuatus (Fig. 165 *c*).

2. Talipes calcaneus gives rise to elevation of the front of the foot, so that the patient walks upon the heel. Abduction may or may not be associated.

3. Talipes varus causes inversion and adduction of the anterior two-thirds of the foot (center of rotation formed by the astragaloscaphoid and calcaneocuboid joints), with elevation of the posterior third.

4. Talipes valgus is characterized by eversion and abduction of the anterior part of the foot, with elevation of



the outer border, being accompanied by flattening of the arch.

**Treatment.**—*General.*—Manipulation, massage, electricity, douche, mechanical retention apparatus, elastic traction.

*Special.*—(1) *Talipes equinus*: Subcutaneous division of the tendo Achillis (plantar fascia and tendons of the toes may also require division). Plaster-of-Paris retention-dressing with the foot at right angles, held for seven to ten days. Shoe and brace. (2) *Talipes calcaneus*: Manipulation, douche, fixation by means of plaster-of-Paris dressing; shoe and brace; tenotomy (shortening of the tendo



FIG. 167.—Double equinovarus.

Achillis). (3) *Talipes varus*: Manipulation; retention bandage; plaster of Paris; adhesive straps; elastic traction; tenotomy (section of the tendo Achillis); shoe and brace. (4) *Talipes valgus*: Manipulation; supporting steel plate worn in the shoe; shoe and brace; plaster-of-Paris retention-bandage.

**Prognosis.**—Favorable in congenital forms when treatment is begun early. Guarded in acquired varieties.

#### CLUB-HAND.

A rare deformity (Fig. 168), analogous to club-foot, in which a condition of either flexion or extension exists, associated with malformation of the radius and carpus.

**Etiology.**—Congenital; paralysis.



FIG. 168.—Double club-hand.

**Treatment.**—Massage, manipulation, supplementary apparatus, tenotomy.

**Prognosis.**—Guarded.

### PES PLANUS.

(Flat Foot.)

**Definition.**—A deformity of the foot characterized by a partial or complete obliteration of the plantar arch.

**Etiology.**—Congenital; rickets; general weakness combined with occupation requiring long-continued standing; excessive walking in the poorly developed (rarely causes).

**Symptoms.**—Pain (produced by standing). Determine outline of the foot by inspection; observation of the foot-track after wetting the bared sole (solid outline) compared with a normal outline (Fig. 169).



FIG. 169.—Print of a normal foot-sole (a) and of a flat foot-sole (b) (Albert).

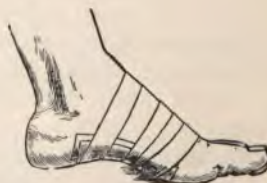


FIG. 170.—Strapping for fallen instep.

**Treatment.**—Improve the hygiene; tonics. *Local:* Strapping (Fig. 170); flanged steel elevated plate worn in the shoe permanently.

**Prognosis.**—Good for relief of the disability; guarded permanent cure.

**PES CAVUS.**

(Hollow Foot.)

**Definition.**—A deformity of the foot giving rise to exaggeration of the arch, with approximation of the heel and the heads of the metatarsals.

**Etiology.**—Congenital infantile paralysis; rickets; traumatism.

**Symptoms.**—Pain upon standing or walking. Observation of the wetted foot-track shows narrowing or absence of the isthmus noted in a normal outline.

**Treatment.**—Massage, douche, manipulation, strapping, sole-plate; tenotomy and dissection.

**Prognosis.**—Guarded.

**HALLUX VARUS OR VALGUS.**

**Definition.**—A deformity of the great toe, characterized by displacement from (hallux varus) or toward (hallux valgus) the other toes (Fig. 171).

**Etiology.**—(a) Ill-fitting shoes or stockings gives rise to hallux valgus (the commoner variety); (b) rheumatoid arthritis.

**Treatment.**—Massage; retention apparatus; splint; adhesive-plaster strapping; excision of the joint; section through the metatarsal bone.

**Prognosis.**—Good.



FIG. 171.—Hallux valgus and bunion (Bradford and Lovett).

**DEFICIENT OR SUPERNUMERARY BONE FORMATION (CONGENITAL).**

Occurs as a result of arrested development or absence of an anatomic segment.

**Treatment** consists in removal (hypertrophied or supernumerary toes or fingers); application of prosthetic apparatus in deficiencies of the long bones of the extremities.

Supernumerary digits (polydactylism).



## CHAPTER XV.

### SURGERY OF THE JOINTS.

#### BURSITIS.

**Definition.**—Inflammation of a bursa.

**Etiology.**—Direct injury; overuse; long-continued friction or pressure.

**Morphology.**—(1) *Superficial*: Enlargement of normally situated or of adventitiously formed bursal sacs with or without thickening of the lining walls. (2) *Deep*: Develops from offshoots of synovial joint sacs or from tendon-sheaths. The contents consist of synovial fluid (normal,



FIG. 172.—Housemaid's knee.



FIG. 173.—Strapping for bunion.

serous, bloody, purulent); may contain cholesterin, calcareous (rice-bodies), or bony deposit; may undergo fibrous, bony, or malignant change (sarcoma).

**Symptoms.**—(a) *Acute*: Pain, localized (globular swelling; tenderness, with redness of the skin). (b) *Chronic*:

Gradual (usually painless) enlargement at a bursal site (hygroma)—(1) Prepatellar (housemaid's knee) (Fig. 172). (Note that the patella is not floated); (2) over the olecranon (miner's elbow); (3) over the tuber ischii (weaver's bottom); (4) over the metatarsophalangeal joint of the great toe, associated with articular displacement (bunion). While this is the usual seat for bunion, it may occur upon any part of the foot.

Chronic bursitis may undergo acute exacerbation, going on to suppuration, with evacuation and obliteration of the sac, or may set up widespread cellular tissue and joint infection.

**Treatment.**—*Acute superficial forms:* Enforced rest; elevation; strapping (Fig. 173); cold (ice-bag); aspiration; free incision with drainage (if infected). *Deep:* Immobilization; rest; elevation; strapping; aspiration. *Chronic:* Incision, with packing or drainage; firm strapping; counterirritation (small blisters, Paquelin cautery); aspiration; aspiration with injection (carbolic acid, 1 or 2 drops); irrigation (hot sterile water); dissection of the sac. *Deep-seated:* Counterirritation (hot-air baking).

**Prognosis.**—Favorable.

### SYNOVITIS.

**Definition.**—Inflammation of a synovial membrane (joint-lining).

**Etiology.**—Direct injury (external wound, sprain, contusion); exposure to cold and wet; diathesis (rheumatism, gout, tuberculosis, syphilis); intercurrent disease (typhoid fever, pyemia, gonorrhea).

**Symptoms.**—(a) *Acute.*—Pain well marked, increased by pressure or motion of the joint affected, often worse at night; may be referred to a neighboring joint (synovitis of the hip may give rise to pain in the knee). Swelling (due to effusion into the joint and surrounding soft parts). Fluctuation (distinct in early stage, lessened during the progress of the affection by inflammatory lymph change). Position assumed is that of partial flexion. Heat of the parts is in-

creased, with extreme tenderness of the superficial soft parts, but little or no redness of the skin.

(*b*) *Chronic*.—Symptoms subside, except for swelling (hydrarthrosis, dropsy of a joint), crepitation or crackling (due to frictional contact of organized bands and adhesions).

**Treatment.**—*Acute*.—Enforced rest; elevation; cold (ice-bag); hot fomentations; firm pressure (strapping); lead-water and laudanum; plaster-of-Paris-bandage dressing. Aspiration.

*Chronic*.—Rest; massage; hot-air baking; iodine ointment; mercury and belladonna ointment, *āā*; counterirritation (small blisters, Paquelin cautery). Treat the diathesis.

**Prognosis.**—Good for acute, guarded for chronic.

## ARTHRITIS.

**Definition.**—Inflammation of a joint as a whole.

**Morphology and Etiology.**—(1) Acute; (2) chronic. Occurs as a result of—(*a*) Increasing synovitis; (*b*) infective pus micro-organisms, gonorrhea, typhoid fever, measles, small-pox, scarlet fever, erysipelas; (*c*) diatheses (rheumatism, gout, syphilis, tuberculosis; (*d*) neuropathic (hysteria, locomotor ataxia).

**Symptoms.**—Pain marked, worse at night, and accompanied by spasmodic contractions of adjoining muscles—"jumping"; swelling (uniform, doughy, rather than fluctuating; crepitus (grating of denuded bone); heat, redness (may not be pronounced, owing to deep position of the inflammation); position (characteristic flexion and fixation); fever.

**Complications and Sequelæ.**—Abscess, pyemia, ankylosis, dislocation.

**Treatment.**—Rest (enforced); position; elevation; extension. Hot fomentations; cold (ice-bags); counterirritation (small blisters, Paquelin cautery, hot-air baking); application of mercury, belladonna, and ichthyol ointment; strapping; plaster-of-Paris-bandage immobilization; aspiration; incision; drainage; injection (carbolic acid, 3 to 5 per cent.; iodoform emulsion, 10 per cent. in olive oil); curetting (arthrectomy, erosion of joints).

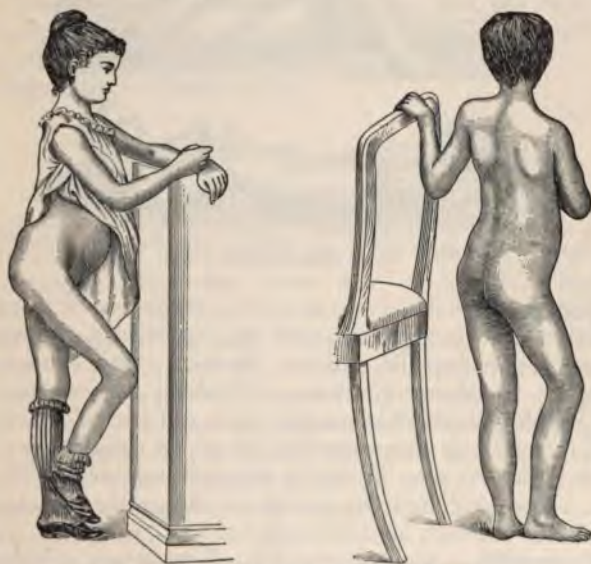


## ARTHRITIS OF THE HIP-JOINT.

(Hip Disease; Morbus Coxarius; Coxalgia.)

**Definition.**—Tuberculosis of the hip. An affection occurring chiefly in early life.

**Morphology.**—(1) Femoral, in which the head of the femur is primarily affected. (2) Acetabular, in which the acetabulum is first affected. (3) Arthritic, beginning in the soft parts about the joint.



FIGS. 174, 175.—Positions in coxalgia (Albert).

**Etiology.**—Predisposing causes: latent, tuberculosis; active, exposure, slight injury (blows, sprains, or falls).

**Pathology and Symptomatology.**—*First stage:* Deposit and irritation giving rise to pain (in affected joint and in corresponding knee), worse at night, and may be of a "starting" or "jumping" character (a muscular spasm); limp; abduction. *Second stage:* Effusion; increased pain, limp, and abduction, with disappearance of the gluteal fold

(flattening of the hip); lengthening of the limb (due to twisting of the pelvis) (Figs. 174, 175). *Third stage:* Suppuration, with destruction of the joint (abscess); marked adduction; flexion; atrophy of the limb; shortening (due to absorption of the head of the femur); pain (Figs. 176, 177). Constitutional decline is progressive.



FIGS. 176, 177.—Effects on the lumbar spine of flexing and extending the diseased leg in hip disease (Albert).

**Treatment.**—Rest of the parts; extension by confining to bed with the application of Buck's stirrup; plaster-of-Paris cast; orthopedic splints. Incision, with drainage of abscess. Iodoform emulsion. Packing the suppurating cavity with gauze impregnated with pulverized flowers of sulphur has been recommended for use in tuberculous bone or joint disease, also in badly infected wounds of the soft parts. Constitutional treatment is supportive, tonic, and stimulative. Fresh air and sunlight.

**Prognosis.**—Always guarded. Temporary ankylosis in a good position is oftentimes the most that can be hoped for. Early recognition and protracted treatment are of vital importance.

#### ARTHRITIS OF THE SACRO-ILIAC JOINT.

(Sacrocoxalgia; Sacro-iliac Disease.)

**Definition.**—Tuberculosis of the sacro-iliac articulation. The affection is of comparative rarity, and occurs chiefly in young adults.

**Symptoms.**—Pain (increased by motion or by pressing the sides of the ilium together); swelling; limping.

**Diagnosis.**—Hip-joint disease: The differential diagnosis is often difficult. Position, flexion, elongation, pain (referred to the knee) will aid in the diagnosis. Sciatica: Location, duration, and character of the pain will serve in differentiation.

**Treatment.**—Rest; immobilization by means of plaster of Paris; orthopedic splints; aspiration and injection of iodoform emulsion (10 per cent.); incision and drainage after abscess formation. Constitutional: Fresh air; sunlight; supportive and tonic treatment.

**Prognosis.**—Unfavorable.

### RHEUMATOID ARTHRITIS.

(Arthritis Deformans; Rheumatic Gout.)

**Definition.**—A chronic affection of the joints, giving rise to erosion of the articular surfaces with ankylosis.

**Etiology.**—Heredity; male sex; middle life; bad hygiene.

**Pathology.**—Obscure. May resemble gout and rheumatism or partake of the nature of neuropathic arthritis. Swelling of the synovial membrane with nodular outgrowth takes place. Gradual absorption of the cartilages takes place, the heads of the bones becoming like ivory. Exostoses form, with thickening of the peri-articular tissues. Atrophy of surrounding muscles generally takes place. All joints may be affected.

**Morphology and Symptomatology.**—1. *Acute.*—Attacks several joints at once; manifested by pain, swelling, redness, and moderate fever. The symptoms subside, to reappear from time to time in varying severity.

2. *Chronic.*—Begins usually in the knuckle-joints, wrists, knees, toes, ankle, and spine (symmetric joints commonly affected). Pain, swelling, and redness give way to stiffening, with creaking of the joints; finally, ankylosis with contractures of the extremities.

**Treatment.**—Improve the hygiene. Tonics and stimu-



lation (iron, strychnin, arsenic, phosphorus). Treat the diathesis. Locally apply massage, electricity, hot-air baking, steaming, inunctions of mercury and iodine.

**Prognosis.**—Unfavorable for cure. Persistent treatment, however, will retard the progress of the disease.

**Tuberculous arthritis** may also occur in the knee-, ankle-, elbow-, shoulder-, wrist-, and phalangeal joints.

**Symptoms.**—Pain; swelling, with progressive disintegration of the joint attacked, giving rise to suppuration and abscess formation.

**Treatment.**—Rest (elevation, immobilization, splints, slinging); injection of iodoform emulsion (10 per cent.); incision, with drainage of abscess cavities; erosion of the joint cavity.

**Constitutional Treatment.**—Tonic and supportive under the best possible hygienic surroundings (fresh air and sunlight).

**Prognosis.**—Guarded. Early recognition and treatment are imperative.

**Gonorrheal Arthritis (Gonorrheal Rheumatism).**—Occurs more often in the male sex; about the third or fourth week of the urethritis. The knee- and ankle-joints and joints of fingers and toes are most often affected.



FIG. 178.—Ataxic knee-joint.

**Treatment.**—Cold (ice-bag or water-coil); hot fomentations; firm compression

(strapping, Esmarch bandage applied at intervals for fifteen minutes to one hour); aspiration; incision with drainage.

**After-treatment.**—Massage; hot-air baking; counterirritation (blisters, Paquelin cautery).

**Prognosis.**—Guarded.

**Neuropathic Arthritis (Tabetic Arthropathy; Charcot's Disease).**—Occurs during the course of locomotor ataxia; gives rise to rapid disintegration of joint cartilage and adjacent bone. Grating and crackling upon movement. Mobility is greatly increased (due to destruction of the ligaments), resulting in subluxation or dislocation (Fig. 178).

*Treatment.*—Supportive orthopedic splints.

*Prognosis.*—Unfavorable.

**Hysterie Joints.**—Occur usually in young unmarried females.

*Symptoms* are negative.

*Treatment.*—Local measures directed to the joint affected are contraindicated. Treat any constitutional or visceral disease. Tonics; hygiene; moral and hypnotic treatment.

*Prognosis.*—Usually favorable.

### SPRAIN.

**Definition.**—A temporary displacement of a joint, accompanied by stretching or tearing of the ligaments. Sprain is the commonest joint injury.

**Etiology.**—External violence, as a sudden twist or fall upon the foot (ankle sprain) or hand (wrist sprain).

**Pathology.**—The line of injury usually occurs in the parts having least motion (lateral in ankle sprain). Tearing varies from the rupture of a few fibers to laceration through the capsular ligament, accompanied by fracture or dislocation. Laceration of the synovial membrane occurs by buckling in the joint or from overstretching, with effusion and extravasation of blood and synovial fluid.

**Symptoms.**—Pain (instant and severe); rapid inflammation with marked tenderness; position assumed is that of least tension (wrist, semiflexed and abducted; ankle, foot in "pointed-toe" position).

**Complications and Sequelæ.**—Ankylosis (oftentimes the result of stripping up (scaling) of the articular cartilage—sprain-fracture); chronic arthritis (rheumatic); suppurative (tuberculous).

**Treatment.**—Early (before inflammatory reaction is marked), firm strapping with adhesive plaster and bandage or plaster-of-Paris-bandage dressing. In the case of the ankle, have the foot at right angles. Watch carefully to avoid injurious constriction. Later, reduce inflammation by cold (ice-bag), hot fomentations, hot salt water, massage, immobilization of the joint by plaster-of-Paris or adhesive

straps. Absolute rest in bed with immobilization and elevation of the limb from the beginning may be required. Aspiration.

*After-treatment.*—Elastic bandage or support. Counter-irritation; hot-air baking for ankylosis or chronic arthritis. Aspiration, injection, incision, irrigation, erosion, excision, for suppuration.

**Prognosis.**—Guarded. Some disability will result after all but the mildest sprains.

### ANKYLOSIS.

(Stiff Joint.)

**Definition.**—Partial or complete loss of function in a joint (Fig. 179).

**Morphology.**—(1) Partial (incomplete or fibrous ankylosis), characterized by fibrous bands (organized lymph) connecting the articular surfaces, with contraction and adhesion of neighboring muscles and tendons—false ankylosis (arising from disuse). (2) Complete (bony ankylosis), characterized by—(a) complete bony union of the articulating surfaces (synostasis); (b) fibrous ankylosis (Fig. 179) combined with bony arch formation.



FIG. 179.—Ankylosis and contractures in tuberculosis of the knee-joint (Tillmanns).

**Etiology.**—Fracture; synovitis; arthritis; disuse (false ankylosis; adhesion and contraction of surrounding muscles and tendons).

**Pathology.**—Organization of exudate in or about the joint (synovial, serous, bloody, purulent), with or without erosion of the articular cartilages.

**Symptoms.**—Partial or total restriction of motion in a joint.

**Treatment.**—Massage; electricity; hot-air baking; counterirritation (Paquelin cautery); forcible movement



under general anesthesia; weight extension; incision; excision; fracturing.

**Prognosis.**—Guarded. Too active procedures are contraindicated in cases following sepsis or tuberculosis.

### SPINAL CURVATURES.

**Definition.**—Pathologic curvature of the spinal column depending chiefly upon relaxation of the spinal ligaments and muscles as a result of debility. Occurs most often in young females.

**Morphology.**—(1) Scoliosis: Later, curvature characterized by two or more curves having their convexities pointing upon opposite sides. Twisting of the vertebræ upon themselves occurs at the site of the curves. (2) Kyphosis: Excurvation, anteroposterior curvature (hump-like projection). (3) Lordosis: Incurvation, anteroposterior (sinking in).

**Etiology.**—Predisposing causes: Bad hygiene; puberty; ill health; rickets; struma. Active cause: Habit (posture).

**Pathology.**—In uncomplicated cases there is relaxation of ligaments and muscles. When severe or complicated, there is erosion of the anterior portions of the bodies of the vertebræ with absorption of intervertebral cartilages.

**Symptoms.**—Falling of one shoulder or growing out of one scapula (winging), projection of the opposite ilium. Pain in the back and shoulder (manifested when sitting or lying down). Deviation in the normal line of the vertebræ.

**Treatment.**—Improved hygiene; graduated exercises; massage; passive motion; electricity; plaster or leather jacket (palliative); incline seated chair (to elevate the pelvis and thus straighten the spinal curve).

**Prognosis.**—Good in the young when seen early and under protracted treatment.

### POTT'S DISEASE.

(Tuberculosis of the Spine; Spondylitis; Anteroposterior Curvature.)

**Definition.**—Tuberculosis of the spine, beginning usually in the bodies of the vertebræ as an osteitis. The dis-

ease is common in early life of poorly nourished children (tuberculous diathesis).

**Etiology.**—Predisposing cause: Bad hygiene in the presence of the tuberculous diathesis. Active cause: Slight traumatism (falls or blows); exposure (cold or wet).

**Pathology and Symptomatology.**—Deposit and development of the bacilli give rise to tuberculous degeneration, beginning in the cancellated structure of the bone. The process may be stayed, with the formation of fibrous tissue and a return to health, or when destruction of bone



FIG. 180.—Manner of picking up an object in Pott's disease.



FIG. 181.—Standing position in Pott's disease.

and cartilage has taken place, ankylosis with more or less deformity and functional disability resulting. Complete destruction gives rise to marked deformity (angular curvature) with abscess formation.

**Early Symptoms.**—Spinal irritation (weakness, numbness, tingling in the lower extremities); pain (referred to the region supplied by the spinal nerves arising near the affected area); pain is elicited by making pressure upon the child's head or by a jolting jump; tenderness upon pressure (Figs. 180, 181).

Paralysis (incontinence of urine and feces); abscess pointing in—(a) the pharynx, side of the neck, or in the axilla (cervical); (b) courses down beside the great vessels to the iliac fossa, above Poupart's ligament, through the back of the pelvis, passing out through the sacrosciatic notch to the gluteal region, forward along the ribs to the side of the trunk, directly backward, forming (lumbar or dorsal abscess) internally (bursting into the esophagus or bronchial tubes), mediastinal (upper dorsal); (c) descent in the sheath of the psoas muscle, pointing below Poupart's ligament; lumbar region, perineum, thigh, leg (lower dorsal and lumbar).

**Diagnosis.**—Aneurysm from psoas abscess by history, thrill, absence of fluctuation; hernia by history, absence of fluctuation (both abscess and hernia may be reduced); tumor by history, not reducible, exploring needle.

**Treatment.**—Enforced rest (long continued); extension and counterextension apparatus; spinal jacket; ice-bag for pain; tonics (iron, lime salts, cod-liver oil); improve hygiene; fresh air and sunlight. Treat abscess as soon as the diagnosis is made by incision and drainage; iodoform emulsion.

**Prognosis.**—Always guarded.

## DISLOCATION.

(Luxation.)

**Definition.**—A permanent partial or complete displacement of the articulating bone-surfaces in a joint.

**Morphology.**—(1) Complete, in which the articulating surfaces are completely separated or touch only at their edges; (2) partial, incomplete, or subluxation, in which the articulating surfaces are in partial contact; (3) simple, in which there is no communication with the external air; (4) compound, having communication through a wound of the soft parts; (5) complicated, having associated fracture of the bones making up the joint, rupture of the main artery, nerves, or muscles of the part; (6) recent, in which sufficient time has not elapsed for the inflammatory reaction seriously to interfere with reduction; (7) old, having existed for some



time; or one in which the articulating surfaces have formed firm adhesions with surrounding parts; (8) single (unilateral), occurring in but one joint; (9) double (symmetric with relation to the two sides of the body, as shoulders or hips); (10) bilateral (symmetric with relation to the middle line of the body, as in the lower jaw or vertebra); (11) total when both ends of a bone are displaced (may occur to the clavicle, carpal or tarsal bones); (12) multiple, when two or more joints are affected at the same time.



FIG. 182.—Double congenital dislocation of the hip (Stimson.)

**Etiology.**—(a) Traumatic, accidental, due to the sudden application to a joint of direct or indirect violence or muscular action; (b) spontaneous, pathologic follows gradually or suddenly after disease change in the joint or after paralysis (myopathic dislocation is most common in the shoulder, due to the weight of the limb); (c) congenital; these occur during intrauterine life as a result of malformation (Fig. 182).

**Predisposing Causes.**—Male sex; middle life; poorly developed; anatomic conformation (ball-and-socket joints are more liable to become dislocated than ginglymoid—hinge).

**Pathology.**—Have laceration of one or more of the ligaments of the joint, with effusion of the blood and

synovial fluid. Rarely in traumatic luxations (lower jaw) and habitually in the spontaneous variety laceration does not occur. Fracture, wounding of the soft parts, rupture of muscles, nerves, or important blood-vessels of the part may occur.

**Symptoms.**—(1) Deformity (presence of the head of the bone in an abnormal position; change in the shape of the joint; alteration in length, either shortening or elongation);

(2) immobility ; (3) ecchymosis ; (4) pain (swelling, extravasation, neuralgic from laceration and compression of nerves) ; (5) paralysis.

**Treatment.**—Effect reduction at once unless contraindicated by great shock or associated injuries. Employ manipulation ; overcome muscular resistance by forcible or persistent traction, sudden blow, apparatus ; anesthesia. Arthrotomy (performed during the first forty-eight hours or at the end of six week's time). Congenital hip-joint dislocation is usually bilateral. *Lorenz treatment*: forcible flexion, extension and rotation of the affected thigh under general anesthesia ; return the head of the femur to its normal position ; retain by plaster cast for a period of from six to ten months (thigh in a semiflexed, abducted position). Improvement, if not cure, said always to result. Dangers: Rupture of main artery of the limb ; fracture.

Hoffa, who claims 80 per cent. of successes, puts the limb on a stretch ; opens the joint by external longitudinal incision ; gouges a cup-shaped cavity in the ilium for the head of the femur. In the shoulder-joint and where the joint capsule is very loose, silk retention and purse-string sutures are applied.

*After-treatment.*—Complete rest (splints ; bandaging, slinging) for one or two weeks, when passive motion may be begun. Treat the local inflammation.

**Prognosis.**—Always guarded.

## SPECIAL DISLOCATIONS.

### LOWER JAW.

Occurs as a result of direct injury or muscular action. May be unilateral or bilateral ; is found chiefly in young adult females.

**Symptoms.**—1. *Forward Dislocations.*—Projection of the chin ; inability to close the mouth ; immobility ; depression at the site of the articulation, with slight anterior fulness (condyle) ; pain ; swelling ; free flow of saliva.

In unilateral dislocation the jaw inclines toward the opposite side (toward the same side in fracture).

2. *Backward Dislocation (Rare).*—Fracture through the anterior wall of the external auditory meatus occurs with fixation.

**Treatment.**—Reduce by making strong downward pressure at the angle of the jaw by hooking the thumbs (well protected) upon the molar teeth; at the same time elevate the chin with the fingers. Reduction has been secured by a sharp, quick blow delivered upon the chin after downward pressure with the thumbs has disengaged the condyles.

*After-treatment.*—A four-tailed head bandage may be worn for a few days.

**Prognosis.**—Usually favorable.



FIG. 183.—Fracture dislocation of the seventh cervical and first dorsal vertebrae (Thorburn).

#### HYOID BONE.

This is rare.

**Treatment** consists in forcing the head back, depressing the lower jaw, and reduction by manipulation.

*After-treatment.*—Fixation by means of a paste-board collar splint.

**Prognosis.**—Guardedly favorable.

#### VERTEBRA.

(Diastasis.)

It is rarely encountered. In the lumbar and dorsal region fracture is commonly associated (Fig. 183).

**Treatment.**—Manipulation; extension; counterexten-



sion. Permanent extension—weight-extension apparatus; plaster or leather jacket with head support (Figs. 184, 185).

**Prognosis.**—Guarded.



FIG. 184.—Plaster-of-Paris jacket (Sayre).



FIG. 185.—Plaster-of-Paris jacket and jury-mast applied (Sayre).

### COCYX.

Occurs most often in women. May be due to direct injury (child-birth; straining from constipation), and gives rise to pain (severe and lancinating at times), nervous disturbance. The diagnosis is made by examination with the finger in the rectum. The dislocation is easily reduced, but is prone to recur. Treatment by excision of the bone is most satisfactory.

### CLAVICLE.

1. **Acromial End.**—(a) Upward; (b) upward and outward (overlapping the acromion process of the scapula).
2. **Sternal End.**—(a) Forward (most common); (b) backward; (c) upward.
3. **Total** (both ends simultaneously).

**Symptoms.**—Pain, swelling, dysphagia, dyspnea (pressure upon the trachea and esophagus); deformity.

**Treatment.**—Reduce by manipulation, drawing upon the shoulders with the knee pressed between the patient's shoulder-blades. Retain by compress and posterior figure-of-eight bandage. Adhesive-plaster strapping. Sling the forearm, having the arm bound to the side of the chest.

**Prognosis.**—Usually favorable.

#### SCAPULA.

Dislocation or projection of the inferior angle of the scapula from beneath the latissimus dorsi muscle.

**Treatment.**—Reduce by manipulation and secure retention by adhesive-plaster strapping, bandage, and slinging the arm.

**Prognosis.**—Guardedly favorable.

#### RIBS.

May occur at either end. Treat as for fracture.

**Prognosis.**—Guardedly favorable.

#### STERNUM.

(Diastasis.)

Rare. Occurs at the junction of the manubrium with the gladiolus or at the junction of the ensiform with the gladiolus.

**Symptoms.**—Deformity (lower fragment rises in front of the upper); disturbance of respiration and circulation.

**Treatment.**—Reduce by manipulation; forcible extension of the trunk. Retain by strapping.

**Prognosis.**—Favorable if uncomplicated.

#### SHOULDER.

(Head of the Humerus.)

**Morphology.**—(1) Downward (subglenoid), head of the bone rests in the axilla.

(2) Forward (subcoracoid), head of the bone rests beneath

the coracoid process of the scapula. When extreme and the head of the bone is forced under the clavicle, known as subclavicular.

(3) **Backward (subspinous)**, in which the head of the bone rests beneath the spine of the scapula.

Rare forms are: Upward (*luxatio erecta*), in which the head of the bone has been forcibly drawn out of its socket. The arm is held vertically, with the forearm resting upon the head. Subtricipital dislocation, in which the head of the bone after a downward dislocation had occurred passed behind the tendon of the long head of the triceps and was subsequently forced behind the glenoid fossa by a lowering of the elbow.



FIG. 186.—Kocher's method of reduction by manipulation: *a*, First movement, outward rotation; *b*, second movement, elevation of elbow; *c*, third movement, inward rotation and lowering of elbow (Ceppi).

**Symptoms.**—(*a*) **Downward.**—Depression beneath the acromion, lengthening of the arm, head of the bone to be felt in the axilla (especially when the elbow is lifted away from the body), arm somewhat abducted (increased by pressing the arm to the side).

With the fingers of the affected side placed upon the sound shoulder an attempt should be made to bring the elbow in contact with the thorax (Dugas's sign). If dislocation is present, this cannot be done.

(*b*) **Forward.**—The head of the bone is felt beneath the coracoid process or the clavicle; abduction; pronounced flattening of the shoulder.

(*c*) **Backward.**—Head of the bone to be felt beneath the



spine of the scapula; prominence of the coracoid process; forward position of the elbow.

**Treatment.**—Manipulation; extension; counterextension. *Köcher's Method*: (a) Flexion of the elbow with forced external rotation of the arm; (b) elevation of the elbow (forward and upward while maintaining external rotation); (c) internal rotation with depression of the elbow in a broad sweep (Fig. 186). Anesthesia may assist in the reduction.

*After-treatment.*—Immobilization of the joint for two to three weeks, followed by restricted movement for a like period. Old unreduced dislocations call for forcible rotation and traction under anesthesia; excision of the head of the bone.

**Prognosis.**—Guarded.

### ELBOW.

Either one or both bones may be affected.

(1) Backward—most common form; (2) forward; (3) lateral.

**Symptoms.**—Deformity, immobility (elbow flexed) (Fig. 187). When the head of the radius alone is dislocated (forward, outward, or backward), it may be felt in the abnormal position. The forearm is found semiflexed and pronated or midway between pronation and supination.

Dislocation of the head of the ulna (rare): backward is manifested by deformity, twisting in of the forearm with pronation.

**Treatment.**—Manipulation, extension, and counterextension. Anesthesia.

**Backward.**—Extension upon the forearm, pressure upon the lower end of the humerus, with flexion of the elbow.

**Forward.**—Forced flexion of the elbow with extension and counterextension.

**Lateral.**—Extension upon the forearm, with pressure upon the displaced bones and counterpressure on the lower end of the humerus.

*After-treatment.*—Immobilization, anterior right-angled

splint for one or two weeks, or slinging the forearm. Open operation is indicated in unreducible forms.

**Prognosis.**—Guarded.

### WRIST.

Dislocation of the lower end of the ulna from the radius:

(a) Forward; (b) backward; (c) inward.



FIG. 187.—Exterior view of supracondylar fracture (Beck).

### CARPUS.

May be—(a) Forward; (b) backward; (c) outward (rare). Individual bones of the carpus (os magnum, pisiform, and semilunare) may be displaced forward or backward.

**Treatment.**—Manipulation; extension; counterextension with pressure. Excision of individual carpal bones has been performed.

*After-treatment.*—Anterior and posterior splints with compresses.

**Prognosis.**—Guarded. Stiffness of the joint likely to be protracted.

### CARPOMETACARPAL.

The metacarpal bones of the thumb, index-, and middle fingers most often affected. May be—(a) Backward; (b) forward; (c) outward (thumb). Recognized by the prominence of the deformity.

**Treatment.**—Reduce by direct pressure and manipulation; retain by means of a straight splint and compresses.

**Prognosis.**—Usually favorable.

**METACARPOPHALANGEAL.**

(Thumb and Fingers.)

May be—(a) Backward (thumb most commonly affected); (b) forward (rare).

**Treatment.**—Reduce by extension, counterextension, and direct pressure. Subcutaneous division of resisting muscle or ligament fibers. Straight splint.

**Prognosis.**—Guardedly favorable.

**PHALANGES.**

(a) Forward; (b) backward (most common); (c) lateral. Reduce by direct pressure and manipulation; retain by adhesive strap or small straight splint.

**Prognosis.**—Guardedly favorable.

**HIP.**

(A) **Regular.**—1. **Backward.**—Posterior, dorsal, ilio-sciatic—commonest form. May be upward and backward on the dorsum ilii or backward into the ischiatic notch (dorsal below the tendon of the obturator internus muscle) (Fig. 188).

**Symptoms.**—The limb is—(a) Shortened ( $\frac{1}{2}$  to 3 inches); (b) flexed; (c) inverted and adducted (knee rests upon the front of the opposite thigh); (d) voluntary motion is lost; passive motion (flexion, adduction possible; extension, abduction impossible); (e) alteration in the shape of the hip (great trochanter prominent).

Reduce by manipulation: Patient anesthetized and placed upon his back. Flex the leg and thigh. Abduct and rotate outward in a broad sweep across the abdomen down to the natural position.

2. **Downward (Downward and Forward).**—The head of the bone may lodge in the obturator or thyroid foramen or pass into the perineum (perineal).

**Symptoms.**—Limb is—(a) Elongated or slightly shortened; (b) abducted; (c) foot straight or slightly everted;



(*d*) trochanter is depressed and the head of the displaced bone may sometimes be felt.

Reduce by reverse of method employed in backward luxations. Flex the leg and thigh. Abduct and rotate inward in a broad sweep across the abdomen down to the natural position. Avoid excessive flexion and excessive adduction to prevent converting the dislocation into a backward luxation.

3. **Upward (Upward and Forward; on the Pubis; Suprapubic).**—The head of the bone rests on or above the pubis.

*Symptoms.*—(*a*) Shortening; (*b*) abduction with great eversion; (*c*) flexion (slight or rarely extensive); (*d*) great depression of the trochanter and prominence of the head of the bone.

Reduce by semiflexion (relaxes the Y-ligament). Semiabduct and rotate inward. While rotating and drawing upon the thigh, carry the knee inward and downward to the side of the other.

(B) **Irregular, Anomalous.**—(1) Directly upward (secondary to pubic form); supracotyloid; (2) directly downward (between the sciatic notch and the thyroid foramen); (3) downward and backward onto the body of the ischium; (4) downward and backward into the lesser sciatic notch; (5) downward, inward, and forward into the perineum.

These forms usually follow great laceration of the ligaments, and their reduction depends upon careful manipulation.

Old dislocations in the presence of great functional disability may call for arthrotomy—excision of the head of the bone; subtrochanteric osteotomy.

**Diagnosis** from fracture is often difficult. It is made by careful examination, absence of crepitus, immobility, difficulty or impossibility of inverting the limb, presence of the head of the bone in abnormal position.

**After-treatment.**—Rest in bed with sand-bags applied to



FIG. 188. — Hip-joint dislocation onto the dorsum of the ilium (Cooper).

the sides of the limb for one or two weeks, or the legs may be bound together. Crutches should be used after leaving the bed.

**Prognosis.**—Always guarded.

### KNEE.

The knee is sometimes affected by loose bodies in its joint cavity (other joints rarely affected) known as floating cartilages. They are single or multiple, free or attached to the synovial fringe by long or short pedicles; are made up of fibrous, bony, or cartilaginous tissue, and in size vary from a pea to a lima bean. Are due to—(a) Outgrowths from the synovial membrane, articular cartilage, or bone (after arthritis); (b) organized blood or inflammatory exudate; (c) accidental chipping off of a piece of bone or cartilage. Rheumatic or gouty diathesis is often associated.

**Symptoms.**—Pain causing sudden arrest of motion; presence of the body felt by the patient or the surgeon; attacks of inflammation of the joint with effusion.

**Treatment.**—Removal by manipulation through a small incision.

**Prognosis.**—Good.

### DISPLACED SEMILUNAR CARTILAGES.

(Internal Derangement of the Knee-joint; Subluxation of the Knee.)

Loosening or detachment of one or both of the semilunar cartilages. Slipping either forward or backward; wedging of the joint takes place.

**Etiology.**—Usually follows tripping over an obstacle or a twist of the knee. Chronic synovitis is a predisposing cause.

**Symptoms.**—Sudden and severe pain with loss of function (the leg at these times is partially flexed and locked) swelling.

**Treatment.**—Reduction by manipulation (flexion, extension with rotation of the leg). Retain and support by a

elastic knee-cap. Opening the joint and suturing the cartilages in place or excision.

**Prognosis.**—Good after operation if aseptic.

### PATELLA.

(1) Outward (commonest form); (2) inward (rare); (3) upward (rupture of ligamentum patellæ associated); (4) vertical rotation (edgewise).

**Symptoms.**—The leg is slightly flexed and immobile (vertical forms may appear with the leg extended). Deformity.

**Treatment.**—Reduce by direct pressure, flexion, and extension of the leg. Rest, with the application of a posterior straight splint for a week or ten days. Retain by an elastic cap worn after the local inflammation has subsided.

**Prognosis.**—Good when uncomplicated.

Head of the tibia may be dislocated—(1) Forward (commonest form); (2) backward; (3) lateral (are always incomplete); (4) by rotation.

**Etiology.**—Follow direct or indirect violence or a twisting of the leg upon the thigh by falling.

**Symptoms.**—Deformity, shortening (if complete).

**Treatment.**—Reduce by forced flexion and pressure, with rocking movements aided by extension and counter-extension if shortening is present.

*After-treatment.*—Fixation by a posterior straight padded splint or a long fracture-box until local inflammation has subsided, when a leather or elastic knee-cap protector may be worn.

**Complications.**—Fracture, embolism, gangrene. When possible, the dislocation should be reduced before the fracture.

**Prognosis.**—Guardedly unfavorable, owing to accompanying complications. Compound dislocation may call for amputation or excision.

### FIBULA.

Either end may be dislocated forward, backward, or upward (rare, except as a complication of serious knee injuries).



**Treatment.**—Reduce by direct pressure and manipulation. Retain by molded splint applied for three or four weeks.

**Prognosis.**—Guardedly favorable.

#### ANKLE.

Dislocation of the foot upon the bones of the leg. May be—(1) Forward (rare); (2) backward (usually accompanied by fracture of the fibula and tibia); (3) lateral (fracture of the malleoli often associated).

Reduce by traction, direct pressure, and manipulation (rotation) after flexing the leg upon the thigh (relaxes the tendo Achillis). Subcutaneous division of this tendon may be required. Retain by molded splint of felt or pasteboard; fracture-box. Plaster-of-Paris dressing after the swelling has subsided to be worn for three or four weeks.

**Prognosis.**—Guarded. Compound dislocation may call for amputation.

#### TARSAL BONES.

(1) Forward (commonest form); (2) backward; (3) outward; (4) inward.

Rotation (twisting of the bone upon its axis) usually accompanies dislocation.

**Treatment.**—Reduction is accomplished by manipulation, direct pressure, and manipulation with the leg flexed upon the thigh. Section of the tendo Achillis may be required. Backward dislocation is usually irreducible. If a useful foot is not obtainable, excision of the bone is required.

**Prognosis.**—Favorable.

#### SUBASTRAGALOID.

Dislocation of the calcaneum upon the astragalus and cuboid; of the calcaneum and scaphoid upon the astragalus; of the calcaneum upon the os calcis and astragalus; of the cuboid, scaphoid, or cuneiform bones may occur.

Reduce by manipulation (traction and direct pressure).

**After-treatment.**—Splints and compresses with rest for one or two weeks.

**Prognosis.**—Good for a serviceable joint. In complicated cases excision or amputation may be required.

#### METATARSAL.

Are complicated by destruction of the soft parts and frequently require amputation.

Reduce by manipulation; retain by splints and compresses.

**Prognosis.**—Guardedly favorable.

#### PHALANGES.

Occur as a result of direct violence usually. May require amputation. Reduce by manipulation. Dress by application of small molded or straight splints or adhesive straps.

**Prognosis.**—Good.

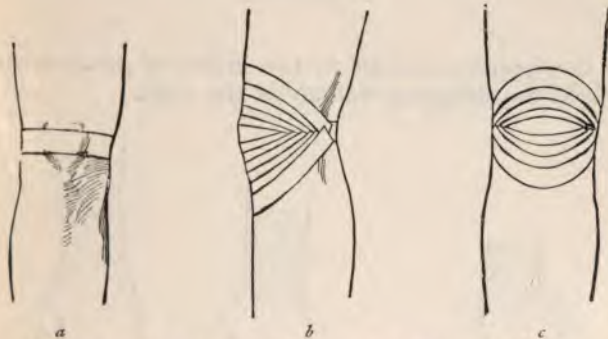


FIG. 189.—Strapping of knee-joint: *a*, First layer; *b*, second layer, side view; *c*, second layer, front view.

#### STRAPPING OF JOINTS.

Employ strips of adhesive plaster from one-half to two inches wide and long enough to extend two-thirds round the joint (Figs. 189-192).

**Indications.**—(a) Sprain; (b) bursitis; (c) synovitis; (d) arthritis.

**Method.**—(a) Begin a few inches below the joint; (b)

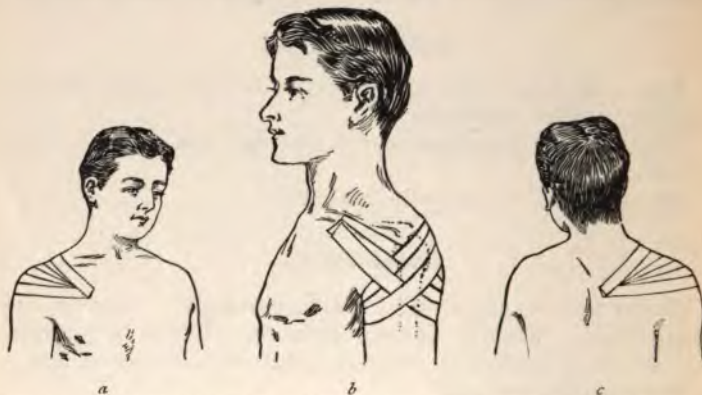


FIG. 190.—Strapping of shoulder: *a*, Anterior view; *b*, reinforcing strips, end layer; *c*, posterior view.

apply overlapping one-half to two inches of previous strip; (c) extend the strapping well above the joint.

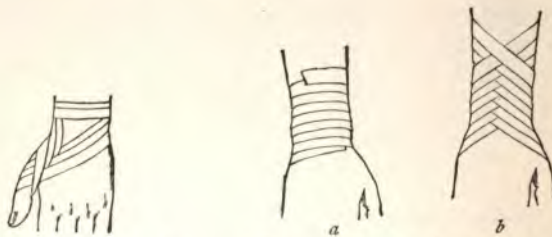


FIG. 191.—Strapping of thumb: First layer passing around the thumb, over the hand to the starting-point.

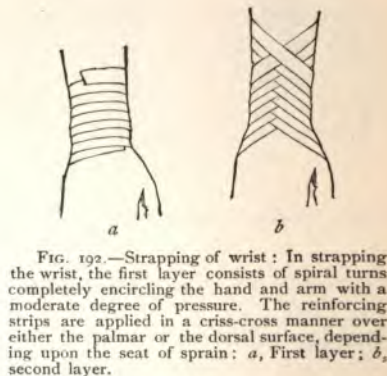


FIG. 192.—Strapping of wrist: In strapping the wrist, the first layer consists of spiral turns completely encircling the hand and arm with a moderate degree of pressure. The reinforcing strips are applied in a criss-cross manner over either the palmar or the dorsal surface, depending upon the seat of sprain: *a*, First layer; *b*, second layer.



**ANKLE-JOINT.**

Employ strips one inch wide. Cover in the entire joint by alternating strips applied at right angles, beginning at the heel (Fig. 193). Avoid constriction by cutting through the plaster cast down the front of the foot.

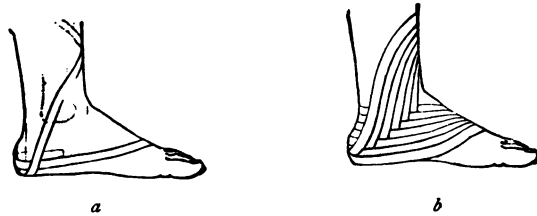


FIG. 193 —Strapping of ankle: *a*, First vertical and horizontal strips; *b*, strips covering the affected side.

## CHAPTER XVI.

### BONE OPERATIONS.

#### INCISION.

MAY be required for: (*a*) Pain caused by periostitis; (*b*) release of fluid beneath the periosteum (pus, blood, serum); (*c*) dislodging foreign bodies.

**Implements.**—Scalpel, scissors, hemostats (6), dissecting forceps, grooved director, retractors (small, sharp-pointed), mallet and straight-edge chisel, Esmarch bandage, needles (curved).

**Method.**—Employ general or local anesthesia. Prepare surface as for an aseptic operation. Avoid large blood-vessels, and split muscles longitudinally.

**Control Hemorrhage.**—(1) Soft parts: Esmarch bandage, hemostats, ligature, position (elevation); (2) bone: Packing, position (elevation), paraffin.

**Secure Drainage.**—Gauze, twist of rubber tissue, catgut, horsehair.

**Dressing.**—Gauze (plain sterile, bichlorid, wet or dry), iodoform or salicylated; rubber tissue (applied shingle fashion over the wound to allow for escape of fluid); sheet covering gauze dressing; bandage; splints; sling or elevation.

#### OSTEOTOMY.

**Definition.**—The operation of cutting through a bone (Fig. 194). Required for: (*a*) Deformity in bone (bow-legs, knock-knees (Fig. 195); (*b*) deformity in a joint (ankylosis of hip-joint).

**Implements.**—Scalpel, scissors, hemostats (6), dissecting forceps, grooved director, retractors (dull and sharp-pointed), mallet and straight-edge chisel, Gigli's and Hey's saw, Esmarch bandage, needles (curved), sand-bag.

**Method.**—General anesthesia. Skin surface prepared as for aseptic operation. Small incision (longitudinal through the soft parts), subcutaneous operation. Drainage-tube or sutures usually not required. Division of the bone may include: (a) Partial chiseling and fracture; (b) complete

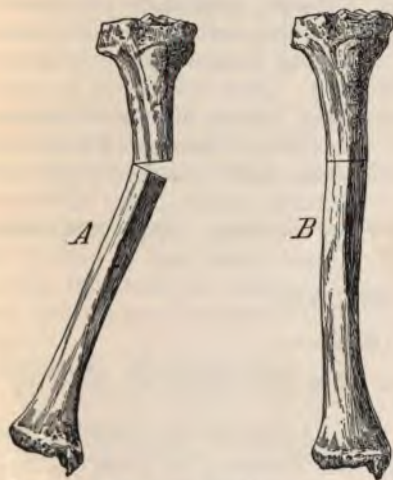


FIG. 194.—Diagram representing a curved tibia: *A*, With a wedge removed on the convex side for the purpose of straightening the bone; *B*, the same with the bone straightened (after Little).

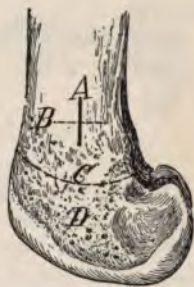


FIG. 195.—Macewen's operation for genu valgum: *A*, Skin incision; *B*, osteotomy incision; *C*, epiphyseal line; *D*, inner condyle.

chiseling; (c) sawing. The section may be—(a) Linear; (b) cuneiform (wedge-shape); (c) trochleaform (curved).

**Dangers.**—(a) Infection (prevent by antisepsis and asepsis); (b) mechanical injury of important nerves or blood-vessels (prevent by care; if it occurs, enlarge incision, suture the nerve, or tie the vessel).

**Dressing.**—Treat as for compound fracture.

#### ARTHROTOMY.

**Definition.**—Incision of a joint.



**ERASION.**

(Arthrectomy.)

**Definition.**—The free opening and removal of diseased joint tissues.

**Required for** tubercular joint-disease.

**Implements.**—Scalpel, scissors, hemostats (6), dissecting forceps, grooved director, probe, retractors (sharp and dull), curet, periosteal elevator, bone-forceps, irrigator, Esmarch bandage, needles.

**Method.**—General anesthesia. Free incision to allow a thorough exploration of the joint. Diseased tissues are removed by the aid of irrigation, knife, scissors, curet and forceps.

**Dressing.**—Provide for free drainage; splint suspension apparatus; sling.

**EXCISION.**

(Resection.)

**Definition.**—Removal of a part (bone or joint) by a cutting operation.

**Required For.**—(a) Long-continued suppuration when life is endangered (bone or joint-disease); (b) great deformity and loss of function (bony ankylosis, compound fracture, or unreduced dislocation); (c) when amputation is the only alternative.

**Implements.**—Scalpels, scissors, hemostats (10), dissecting forceps (rongeur, gouge, lion-jawed, cutting), forceps, probe, grooved director, retractors (sharp and dull), periosteal elevator, saws (Gigli's, Hey's), mallet and chisels, drills, pins, metal bone plates, silver wire, Esmarch bandage, needles, sand-bag.

**UPPER JAW.**

(Osteoplastic Resection.)

**Method.**—General anesthesia. Skin surface prepared.

**Incision.**—(1) *Fergusson's*: Division of the upper lip in the median line, opening the nasal cavity to the root of the

ala, up the side of the nose to a point near the inner canthus, across the infra-orbital ridge to the malar bone. Prevent subsequent scar retraction of lower eyelid by keeping the incision three-quarters of an inch below the edge of the lid. Dissection uncovers the superior maxilla (Fig. 196). (2) *Velpeau's*: From the corner of the mouth, across the cheek to the center of the malar bone. (3) *Langenbeck's*: Formation of a U-shaped flap extending down from the junction of the nasal bone with the cartilage, thence across the cheek upward to the middle of the malar bone. Divide the bone by means of saw, cutting and lion-jawed forceps.

**Control Hemorrhage.**—

(a) By previous ligation of the carotid artery; (b) cautery (Paquelin); (c) forceps; (d) pressure. Suture soft parts in accurate position, packing the cavity and draining through the mouth.

**Dressing.**—Light gauze and bandage.

**Dangers.**—(a) Shock (prevent by despatch in operating; external heat); (b) hemorrhage; (c) aspiration pneumonia.

**Prognosis.**—Guarded.

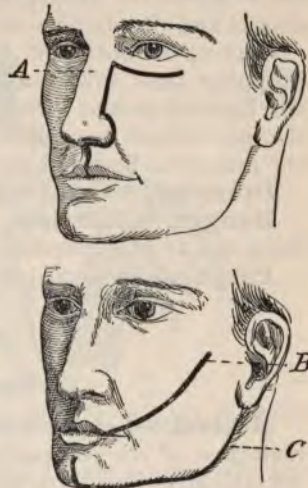


FIG. 196.—Excision of the jaws: A, By a median incision; B, by Velpeau's method; C, excision of the lower jaw.

## LOWER JAW.

**Method.**—General anesthesia. Preparation of skin surface. Head lowered, frequent swabbing of the throat. (1) Through the mouth: (a) Divide the symphysis with a Gigli saw (passed around the bone by means of a curved needle and stout silk suture, or directly through the floor of the mouth); protect the soft parts; (b) dissect and disarticulate.

(2) External incision of sufficient length, and just below the lower border of the bone. Central division of the soft parts (lower lip and chin) if required. Ligate the facial artery in the wound. (a) Divide the bone in the middle line; (b) dissect and disarticulate the two halves.

Control hemorrhage by forceps and ligature. Prevent dropping back (swallowing) of the tongue by means of a silk ligature passed through the tip. When possible, allow the periosteum to remain behind. Suture; drain through the mouth or floor left partially open.

**Dressing.**—Gauze and bandage.

**Danger.**—Aspiration pneumonia (prevent by having head low and by frequent swabbing of the throat).

**Prognosis.**—Guardedly favorable.

### CLAVICLE.

(To Remove All or Part.)

**Method.**—Longitudinal incision with rapid but careful dissection of the soft parts. Divide the bone internal to the affected area, or disarticulate at the sternal junction, elevate, and remove. Control hemorrhage by forceps, pressure (fingers, packing). Suture, allowing for drainage.

**Dressing.**—Antiseptic gauze. Bandage arm to the side of the chest, slinging the forearm.

**Dangers.**—(a) Shock (reduce by using despatch in operating and employ external heat); (b) hemorrhage (prevent serious loss by care in dissecting); (c) air in the veins (avoid by care, forceps, pressure).

**Prognosis.**—Guardedly favorable.

### SCAPULA.

**Method.**—(A) **Total** (Fig. 197).—**Incision.**—(a) Single vertical on a line a little posterior to the middle of the spine. Dissection and retraction of the soft parts. (b) Along the line of the posterior border (Langenbeck). (c) Incision.

Turn out the bone, beginning at the superior angle and upper border, thence to the posterior (vertebral) border.



Control hemorrhage with forceps. Ligate subscapular, posterior and dorsal scapular arteries. Clear the anterior surface, acromion and coracoid processes, glenoid fossa. Adjust and suture flaps; provide for drainage.

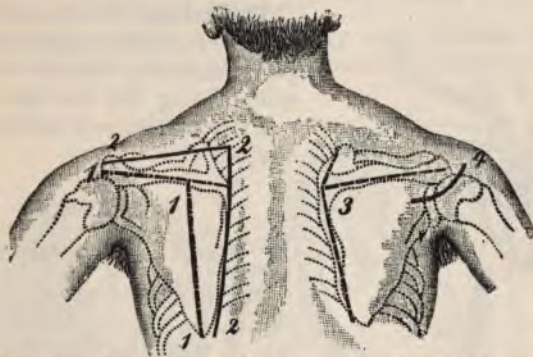


FIG. 197.—Extirpation of the scapula: 1, After Syme; 2, after Langenbeck; 3, after Collier; 4, incision for resection of the glenoid cavity of the scapula (Tillmanns).

**Dressing.**—Gauze and bandage. Arm supported upon a triangular body splint, fastening to the side of the chest, slinging the forearm.

(B) **Glenoid Fossa (Neck of the Scapula).**—*Incision.*—Curved (acromion process downward and outward to below the neck of the bone). Dissect back the flap and remove the portion of bone by cutting or gouge forceps, Gigli saw.

**Prognosis.**—Guardedly favorable.

### SHOULDER.

Scapulohumeral articulation. Head of the humerus (Fig. 198).

**Method.**—(a) **A single, longitudinal incision** (three to five inches long), beginning just to the outer side of the coracoid process—will thus avoid injury to the long head of the biceps muscle. Incise the capsule, free the tuberosities, and the head of the bone may be projected from the wound. Remove the head by means of saw or forceps. Periosteum may be preserved by scaling. The glenoid fossa may be

reached with gouge and cutting forceps through the wound already made.

(*b*) **Flap**, V-, T-, U-, or L-shaped, may be required in some cases of tumor. Avoid axillary vessels and nerves by careful dissection and retraction. Suture, drain.

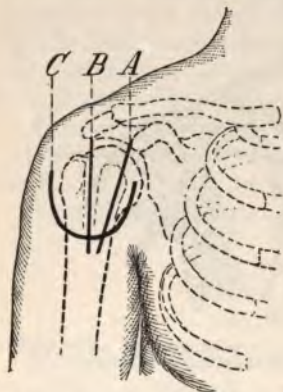


FIG. 198.—Excision of the shoulder: *A*, Vertical incision of Langenbeck; *B*, incision of Baudens, Hueter, and Ollier; *C*, Morel's incision (after Tillmanns).

parts) with sutures. Drain if required.

**Dressing.**—Gauze, bandage, splint as for fracture, or bind the arm to the side. Sling the forearm. Avoid the musculospiral nerve by careful dissection.

Transplanting of bone grafts from other patients or dogs has been successfully performed after total resection of the humerus.

**Prognosis.**—Guarded.

**Dressing.**—Gauze and bandage. Triangular splint; axillary pad; securing the arm to the side. Sling the forearm.

**Prognosis.**—Guardedly favorable.

## HUMERUS.

(Partial or Total Removal.)

**Method.**—**Incision.**—Longitudinal upon the outer side, in one of the muscular interspaces. Divide the periosteum longitudinally (stripping from the portion of bone to be removed). Resect the bone with a Gigli saw, wire the approximated ends (if non-infective). Close the wound (soft

## ELBOW-JOINT.

**Method.**—(*a*) **Single posterior, longitudinal**, beginning two inches above the olecranon, and extending for three inches below in a line parallel and a little to the radial side of the ulnar nerve (Fig. 199). (*b*) **H-shaped**—two lateral with a

connecting cross cut. Dissect and retract flaps. Open the capsule. Uncover the condyles subperiosteally if possible. Avoid the ulnar nerve. Flex the forearm; free the bones, and resect with saw or forceps. Control hemorrhage by means of forceps, ligature, elevation. Suture, closing wound completely or allow for drainage.

**Dressing.**—Gauze and bandage with forearm flexed a little less than a right angle by means of internal angular



FIG. 199.—Excision of the elbow: the clearing of the humerus.

splint or plaster-of-Paris-bandage dressing. Retain position for six to nine weeks if bony ankylosis is desired; begin passive motion during the third week if joint motion is to be preserved. "Flail joint" may be greatly improved by apparatus.

**Prognosis.**—Guardedly favorable.

#### WRIST.

**Method.**—Lower end of the radius or carpal bones.

**Incision.**—(a) Single dorsal, extending from the middle of the metacarpal bone of the index-finger to the dorsum of the radius (Fig. 200). Avoid cutting the extensor ten-



dons by retraction. (*b*) Two lateral longitudinal incisions over the back of the wrist. Incise the capsule, clear the end of the radius, project, and remove it by saw or forceps. Remove the carpus by retracting the soft parts and clearing out the bones by means of cutting and lion-jawed forceps.

Avoid injuring radial and ulnar arteries. Suture wound, draining from the ulnar side if necessary.

**Dressing.**—Gauze and bandage. Anterior and posterior splints (Fig. 201). Sling the forearm.

**Prognosis.**—Guardedly favorable.

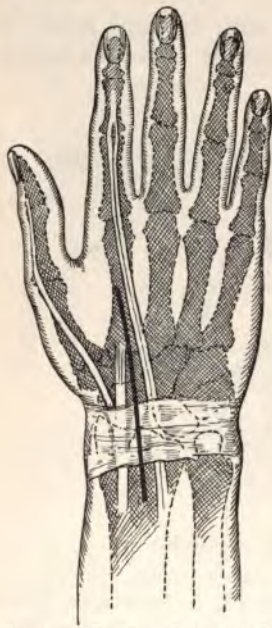


FIG. 200.—Excision of the wrist by Ollier's incision for radial side.

#### METACARPOPHALANGEAL.

**Method.**—Employ a single lateral incision. Divide the lateral ligament, protrude the head of the bone, which may be removed by cutting forceps. Drain or close by sutures.

**Dressing.**—Light gauze and bandage with straight palmar splint.

**Prognosis.**—Good.

#### INTERPHALANGEAL.

**Method.**—(*a*) Single lateral incision. Division of the lateral ligament. Protrude the heads of the bones and remove with cutting forceps. (*b*) Bilateral incisions, dividing the lateral ligaments, projecting the heads of the bones, and removal with cutting forceps. Avoid cutting tendons by retracting. Drain, or close with sutures.

**Dressing.**—Gauze, with bandage and light straight wooden or molded splint. Sling the forearm.

**Prognosis.**—Good.

## STERNUM.

**Method.**—Removal of part or whole of the bone has been performed.

**Incision.**—Median. Retract soft tissues. Divide the costal cartilages and disarticulate with cutting forceps. Close wound with sutures, draining if necessary.

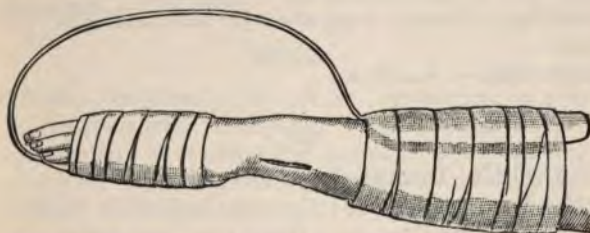


FIG. 201.—Interrupted splint for use after compound fracture; resections.

**Dressing.**—Gauze and bandage with broad adhesive fastening straps.

**Prognosis.**—Guarded.

## RIBS.

**Method.**—Portions of one or more ribs may be required to be removed.

**Incision.**—(a) Single rib; use the lateral incision. Retract soft parts. Control hemorrhage from intercostal vessels by forceps and direct ligation or ligation about the bone. Remove bone by means of saw or cutting forceps. Close with sutures, allowing for drainage. (b) For two or more ribs (thoracoplasty, Estlander's operation): Vertical incision from the middle of the axilla, extending downward or U-shaped incision. Retract or dissect up the flap, uncovering the portions of the ribs to be removed. Resect with saw (Gigli) or cutting forceps. Suture, allowing for drainage at the bottom of the wound.

**Dressing.**—Gauze retained by means of adhesive-plaster straps and bandaging.

**Prognosis.**—Guardedly favorable.

## PELVIS.

**Method.**—Portions of the pelvis have been successfully removed.

**Incision.**—Lateral. Dissection and retraction of the soft parts. Remove diseased portion of the bone or fragments with gouge and rongeur forceps. Close the wound by suturing, providing for drainage if needed.

**Dressing.**—Gauze supported by adhesive-plaster straps and binder.

**Prognosis.**—Guarded.

## HIP.

**Head of the Femur** (Figs. 202–204).

**Method.**—**Incision.**—(a) Curved, beginning midway between the anterior superior spine of the ilium and trochanter, thence downward around the trochanter. Force incision directly to the bone. (b) Longitudinal, across the great

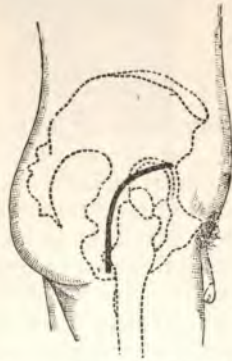


FIG. 202.—Excision of the hip-joint (Tillmanns).



FIG. 203.—Excision of the hip: Luecke's incision.

trochanter: Retract the soft parts; divide the capsular ligament. Force the head of the bone through the wound after division of the ligamentum teres. Resect the bone at any desired level with a saw. Retain periosteum by splitting back from the bone if practicable. Replace and close



capsule and soft parts, draining from the bottom of the wound.

**Dressing.**—Gauze, bandage, and plaster-of-Paris dressing or splints, as for fracture. Continue splint or brace for from two to six months.

**Shaft of the femur** may be done by means of a longitudinal lateral incision. Retain the periosteum if possible.

**Prognosis.**—Guarded.

### KNEE.

**Method.**—**Incision.**—Curved or transverse across the front of the joint from condyle to condyle (Fig. 205). Dissect up the flap, containing the patella. Flex the leg and incise the joint ligaments (carefully avoid injuring the popliteal artery). Uncover the end of the femur. Resect below



FIG. 204.—Excision of the hip: Langenbeck's external incision.



FIG. 205.—Incision for resection of the knee (MacCormac).

the epiphysis (if possible, in children, so as not to interfere with subsequent growth of the bone); saw in a direction from behind forward, from within outward, and from below upward (a plane parallel to the epiphyseal line). Resect the tibia in a like manner, trimming up the edges with cutting or gouge forceps. If diseased, the patella must be removed;

if not affected, it may be left or resected as preferred. Approximate the ends of the bones (may hold in position by wire or catgut suture, nails, or bone-plate splint) if non-infected. Close wound of the soft parts with sutures, providing drainage by rubber tubing inserted through counter-openings or the ends of the operation wound left open. Remove the tubes after three or four days.

**Dressing.**—Gauze and bandage. Immobilize the limb by plaster-of-Paris dressing (aperture cut through at the knee to allow dressings to be changed); metal bracketed splint. Continue the splints for eight to twelve weeks, after which a posterior splint or metal brace may be worn for a similar length of time.

**Prognosis.**—Guarded.

#### PATELLA.

**Method.**—**Incision.**—Longitudinal or crucial. Dissect and retract soft parts; excision of the bone is accomplished by the aid of a cutting forceps. Suture the tendon directly or after stretching. Suture. Drain by a counter side opening. Apply a plaster-of-Paris dressing or bracketed splint.

**Prognosis.**—Good if not infected.

#### TIBIA.

**Shaft.**—Removal may be accomplished through a single longitudinal incision. Allow the periosteum to remain behind if possible. Drain by counteropenings. Apply a bracketed splint dressing, or employ dressing with a fracture-box.

**Prognosis.**—Guardedly favorable.

#### FIBULA.

**Shaft.**—May be removed through a lateral longitudinal incision. Avoid eversion of the foot by careful splinting. Drain by counteropenings.

**Prognosis.**—Guardedly favorable.

#### ANKLE.

**Method.**—**Incision.**—(a) Two lateral; (b) semilunar passing around the lower border of the external malleolus and

continued horizontally for two inches (Fig. 206). Dissect and retract the soft parts. Avoid injuring the dorsal artery of the foot or the extensor tendons. Resect the end of the fibula; remove the astragalus in part or entirely; invert



FIG. 206.—Resection of ankle-joint, after Langenbeck: Incision over the lower end of fibula (a) and tibia (b) (Tillmanns).

the foot and remove the end of the tibia by sawing or cutting forceps. Suture. Drain.

**Dressing.**—Gauze, bandaging, and splint or plaster of Paris is applied with the foot at right angles to the leg, as for fracture.

**Prognosis.**—Guardedly favorable.

## FOOT.

**Astragalus.**—**Method.**—*Incision*, semilunar upon the anterior and outer aspect of the joint (Fig. 207). Resect with gouge or cutting forceps. Avoid deformity by careful splinting. Shoe brace.

**Prognosis.**—Guardedly favorable.

**Calcaneum** (Os Calcis).—**Method.**—*Incision.*—(a) U-shaped heel flap; (b) transverse, beginning at the inner border of the tendo Achillis, passing around the back and outer surface of the foot to a point midway between the heel and the base of the fifth metatarsal bone. A second incision at right angles to the first from near the anterior end extending downward to the grooved internal surface of the bone (Fig. 208). Dissect and retract. Remove the bone by cutting and gouge forceps. Close the wound (pro-





FIG. 207.—*A*, Excision of astragalus (inner incision); *B*, excision of ankle (inner incision).

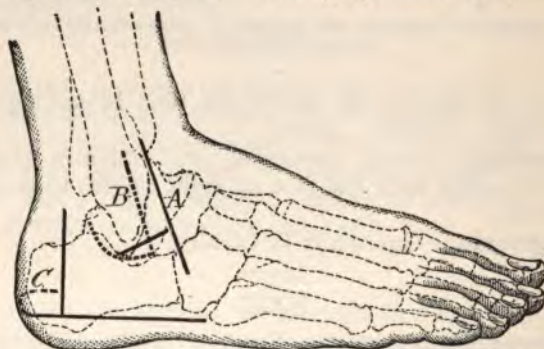


FIG. 208.—*A*, Excision of astragalus (outer incision); *B*, excision of ankle (outer incision); *C*, excision of os calcis.

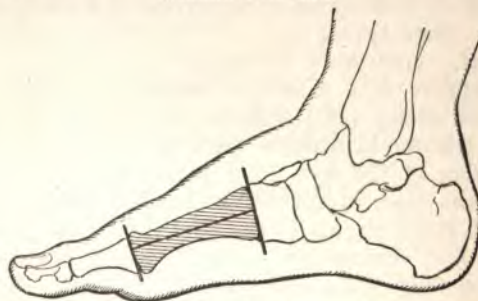


FIG. 209.—Excision of first metatarsal bone.

viding for drainage), dress, and splint the foot at right angles to the leg, as for fracture.

**Prognosis.**—Guardedly favorable.

**Metatarsals.**—**Incision.**—Longitudinal (Fig. 209). Resect the bone with a cutting or a gouge forceps.

**Interphalangeal.**—**Method.**—(a) Single lateral incision. Divide the lateral and capsular ligaments; protrude the head of the bone, remove with cutting forceps. (b) Bilateral; avoid tendons by retracting; drain or close with sutures.

**Dressing.**—Light gauze, bandage, and strapping upon a straight wooden splint (dorsal or plantar).

**Prognosis.**—Good.

### TREPHINING.

**Definition.**—Removal of a circular disc of bone by means of the trephine. Single openings may be connected or enlarged by the use of forceps.

**Required For.**—(a) Bone-disease (ostitis; osteomyelitis; central necrosis; growths within the medullary cavity;



FIG. 210.—DeVilbiss bone-cutting forceps.



FIG. 211.—DeVilbiss trephine..

localized abscess—Brodie's abscess in the head of the tibia); (b) skull (brain abscess; hemorrhage; tumor; arrested development; traumatic epilepsy; fracture; neuralgia; insanity); (c) fracture or dislocation of vertebra (laminectomy).

**Implements.**—Scalpel, scissors, hemostats (6), dissect-

ing forceps, needles, probe, grooved director, retractors (sharp-pointed), periosteal elevator, rongeur and lion-jawed forceps (Fig. 210), trephine (Fig. 211), sand-bag, mallet, chisels (gouge and straight).

**Method.**—General anesthesia; if patient is unconscious, none is needed. Preparation of skin surface as for an aseptic operation.

**Incision.**—(a) Large inverted U-shaped (skull). (b) Longitudinal (long bones and vertebræ). Retract the soft parts. To readily control hemorrhage when working about the skull an Esmarch tube may be applied, or, as has been lately suggested, the application of a large-sized rubber tube which, after being placed about the scalp, is inflated with air by means of a force-pump, thus controlling bleeding by pneumatic pressure. Apply the trephine evenly with the center-pin slightly projected until a groove is formed, when the center-pin must be removed. Continue carefully and slowly until the disc or bone button is cut through (testing the depth of the groove with a probe from time to time). Remove the button, enlarge the opening with gouge or rongeur forceps if necessary. Open the dura for further examination in the skull. Close the soft parts with sutures. Drain for infection.

**Dressing.**—Gauze and bandage.

**Prognosis.**—Always guarded.

## AMPUTATIONS.

**Definition.**—Removal of projecting parts of the body, as extremities, breast, penis. Primary (operation performed before the onset of traumatic fever), first seventy-two hours; intermediary (performed during acute inflammatory stage), two to ten days; secondary (performed after subsidence of fever).

**Indications.**—(1) Compound fracture and dislocation—(a) When accompanied by great laceration of the soft parts and destruction of the skin; (b) rupture of the main artery (in the upper extremity, ligate and treat expectantly). Great comminution and loss of bone (in the lower extremity). (2)



Gangrene. (3) Morbid growths. (4) Deformities. (5) Bone- and joint-disease in individuals with broken constitutions (alcoholism, tuberculosis, chronic kidney disease, old age). (6) Lacerated and contused wounds of soft parts (produced by railways, machinery, wild animals) may call for amputation.

**Implements.**—Esmarch bandage, tourniquet, mattress pins, scalpels, scissors, hemostats (12), dissecting forceps, cutting and lion-jaw forceps, saws, retractors (sharp, two- or three-tailed muslin), tenaculum, needles, rasp.

**Method.**—General anesthesia. Prepare the skin surface. Apply an Esmarch bandage, limb elevated (except in malignant growths).

(A) **Circular.**—Control hemorrhage with Esmarch tube, tourniquet, mattress pins, and rubber tube ligature, compression (digital), position (elevation). Circular incision through the skin and fascia; dissect and reflect a cuff (longitudinal incision upon the side of the cuff may be required). Circular incision through muscles and periosteum at a higher level, depending upon the thickness of the limb. Retract and saw the bone at as high a point as possible. Prevent fracture by supporting the limb until the bone is entirely sawn through. Trim up rough edges with cutting forceps or rasp. Tie the main vessels, pack the bone cavity for continuous hemorrhage (gauze, wax). Resect nerves. Replace tissues, allowing for drainage. Suture, aseptic adhesive straps.

**Dressing.**—Gauze, cotton, bandage, splints, pillow, or sling.

**Oval or elliptic** consists of—(a) Circular method, in which the cuff has been slit at one side and the angles rounded off; (b) formation of perfect ellipse with folding of the flap upon itself (single flap); (c) modified circular, in which the skin-cuff is slit upon both sides and the angles rounded.

(B) **Flap.**—May consist of one or more rectangular flaps (Teale's). Consists of two, the shorter containing the vessels of the limb. They are made of equal width, but the longer equals half the circumference of the limb at the point the bone is to be sawn; the shorter equals one-eighth of the cir-

cumference at the same point. The flaps are cut down to the bone upon each side, which, after being sawn through, is covered by a cushion of the soft parts contained in the longer flap held in position by suturing to the shorter.

**Complications and Sequelæ.**—**Hemorrhage.**—(a) Reactionary, due to relaxation; (b) secondary, from imperfect closure or rupture of vessels. Treat by firm bandaging, cold, elevation, reopening of the flaps and ligating, acupressure, ligation above.

**Muscular Spasm.**—Treat by firm bandaging, strapping, splints, stirrup-extension with weight and pulley.

**Undue Retraction of Soft Parts (Conic or Sugar-loaf Stump).**—Treat by firm bandaging, strapping, extension, splint, resection of the bone.

**Ulceration (Mechanical Ulcer).**—Treat by firm bandaging, splint, strapping, extension.

**Infection.**—Treat by elevation; cold, heat, incision.

**Neuroma (Painful Enlargement of Nerve-endings).**—Treat by counterirritation, resection of the nerves.

Amputation in continuity is amputation in which the bone of the limb is sawn through. Amputation in contiguity is removal of the limb through a joint. Unless otherwise contraindicated, amputate during the primary stage for accidental injuries. It is often of advantage to consult with the artificial limb maker to secure the best mechanical result.

#### SPECIAL AMPUTATIONS.

**Fingers.**—**Method.**—Save as much as possible of thumb and index-finger (removal to the first joint or of the entire digit gives most satisfactory result in others).

**Incision.**—Circular, oval, elliptic (Fig. 212). Divide the bone with cutting forceps or disarticulate. Control hemorrhage by sutures or ligatures.

**Dressing.**—Gauze, adhesive straps, light bandage and straight splint.

**Thumb and Little Finger** (Fig. 213).—**Incision.**—Modified oval with slit and rounded ends. Divide the bone with cutting forceps, saw, or disarticulate.

**Prognosis.**—Good.

**Metacarpus (Wrist).**—**Incision.**—Circular or oval. Control hemorrhage by ligation and elevation.



FIG. 212.—Amputation of a phalanx (after Esmarch).

**Prognosis.**—Usually favorable.

**Forearm (Fig. 214).**—**Incision.**—Circular, modified circular, rectangular flaps.



FIG. 213.—Amputation of the thumb through the metacarpal bone.

**Prognosis.**—Usually favorable.

**Elbow.**—**Incision.**—Circular, elliptic.



FIG. 214.—Modified circular amputation of the forearm (Bryant).

**Arm.**—**Incision.**—Circular, oval, modified oval (Fig. 215). Control hemorrhage by Esmarch tube, compression (sub-



clavian artery against the first rib, arm extended). Axillary artery pressed against the head of the humerus, mattress pins, and tube ligature.



FIG. 215.—Amputation of the arm (Bryant).

**Prognosis.**—Guarded.

**Shoulder-joint.**—Control hemorrhage by mattress pins and tube ligature (Wyeth) (Fig. 216). Pass the pins from

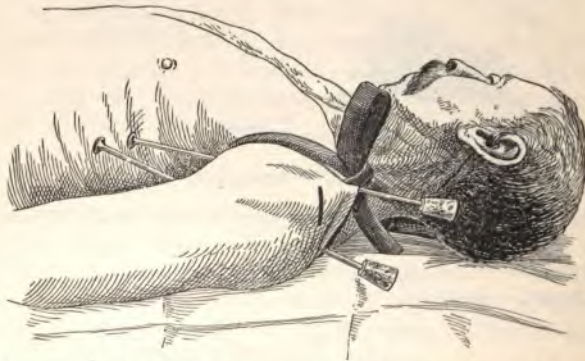


FIG. 216.—Use of Wyeth's pins in amputation at the shoulder-joint. The acromion is marked by a black line (Keen).

up through the axillary folds, emerging one to two inches behind the edge of the acromion process (prevents slipping of the flaps with retraction of the vessels).

**Incision.**—*Oval (Larrey's Method)* (Fig. 217): (a) Longitudinal incision three inches long (deep), beginning below and in front of the acromion process. (b) From the middle make lateral incisions extending to the junction of the axillary folds with the arm. Disarticulate by rotating the arm outward, incising the capsular ligament, long head of the biceps, and subscapular muscle. Rotate inward, dividing infraspinatus, supraspinatus, and teres minor muscles. Clear the head of the bone. (c) Connect the two lateral incisions by a transverse cut forming a flap and removing the limb.



FIG. 217.—Amputation at the shoulder-joint: a, b, c, d, e, Larrey's operation; f, g, Dupuytren operation.



FIG. 218.—Removal of the whole upper extremity (Berger).

Ligate the vessels, trim up the flap, suture, drain. Remove the pins and ligature.

**Dressing.**—Gauze and bandage.

The resulting scar is linear.

**Dupuytren's Method.**—U-shaped incision, forming a large deltoid flap. Dissect and disarticulate. Complete by forming a small internal flap. Control hemorrhage by ligatures; drain; suture.

**Lisfranc's Method.**—Anteroposterior flaps.

**Prognosis.**—Guarded.

**Above the Shoulder** (removal of whole upper ex-

tremity).—**Berger's Method** (Fig. 218).—(a) Incision from the inner end of the clavicle to the top of the shoulder. Resect the middle of the clavicle, secure the subclavian vessels, and cut through the axillary plexus. (b) Incision from the middle of the first, extending across the axilla to the inferior angle of the scapula. (c) Complete the incision. Dissect. Ligate and suture the flaps.



FIG. 219.—A, Disarticulation of the second phalanx of a toe by the racket or oval incision; B, disarticulation of the great toe by the oval incision.



FIG. 220.—Lisfranc's amputation (the dotted line shows the plantar incision) (after Guérin).

**Prognosis.**—Guarded.

**Toes.**—**Incision.**—Disarticulation is preferable (Fig. 219). Oval, lateral flap.



FIG. 221.—Lisfranc's amputation—first step in disarticulating the second metatarsal bone (Guérin).

**All the Toes.**—**Incision.**—Transverse dorsal (convex downward); disarticulation; formation of a plantar flap.



**Prognosis.**—Good.

**Metatarsus ; Tarsus.**—**Incision.**—Flap (short dorsal, convex downward ; long plantar).

**Lisfranc's Method** (Figs. 220–222).—Disarticulation.

**Hey's Method.**—Disarticulate, sawing through the internal cuneiform bone.

**Chopart's Method** (Fig. 223).—Remove all the tarsus but the astragalus and calcaneum.

**Pirogoff's Method.**—Removal of the entire foot except the posterior portion of the os calcis, which is joined to the sawn ends of the tibia and fibula.

**Incision.**—Plantar incision, connecting the malleoli. Dorsal incision, opening the joint.

**Syme's Method.**—Amputation at the ankle-joint (Fig. 224). Foot at right



FIG. 222.—Lisfranc's amputation—second step in disarticulating the second metatarsal bone (Guérin).



FIG. 223.—Chopart's amputation: A, Line of disarticulation; B, the dorsal, and C, the plantar incisions.

angles. Dissect a heel-flap. Open the joint by dorsal incision. Disarticulate. Saw through the malleoli. Drain. Suture.

**Prognosis.**—Usually favorable.

**Leg.**—**Incision.**—Circular, modified circular, anteroposterior flaps (Teale's), lateral flap (Sédillot's) (Fig. 225). Saw fibula one inch shorter than tibia—prevents projection.

**Prognosis.**—Guarded.

**Knee-joint.**—**Incision.**—Elliptic, bilateral flap (Stephen Smith method) (Fig. 226). Commence the incision one

inch below the tuberosity of the tibia; curve downward and backward, then upward to the middle of the popliteal



FIG. 224.—Syme's amputation of the foot (after Esmarch).



FIG. 225.—Sédillot's amputation of the leg (Wyeth).



FIG. 226.—The bilateral flap method of Stephen Smith.

space. Disarticulate. Ligate vessels; drain. Resulting scar is longitudinal.



FIG. 227.—Amputation of the thigh (Bryant).

**Prognosis.**—Guarded.

**Through the Condyles or Above the Knee-joint.**

**—Incision.**—Circular, elliptic.

**Carden's Method.**—Anterior flap. Dissection with removal of the patella.

**Gritti's Method.**—Anterior rectangular flap. Short posterior. Section of the femur above the condyles with removal of cartilaginous surface of the patella. Approximation of the bony surfaces with closure of the flap.

**Thigh.**—**Incision.**—Anteroposterior flaps (Fig. 227). Control hemorrhage by tourniquet, Esmarch tube, ligation. Drain. Suture flaps (aseptic adhesive straps).

**Prognosis.**—Guarded (death from shock).

**Hip-joint.**—Control hemorrhage by tourniquet (abdominal), mattress pins, and tube (Wyeth) (Fig. 228).

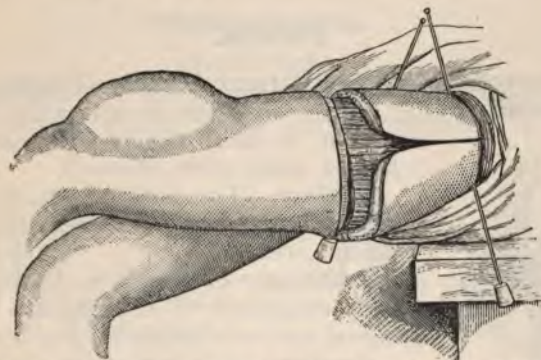


FIG. 228.—Wyeth's bloodless amputation at the hip-joint: The pins and rubber tubing applied; circular and longitudinal incisions for skin-flap.

**Incision.**—Anteroposterior flap (*Liston's method*) by transfixion. Modified circular, lateral flap (*Larrey's method*).

**Guthrie's Method.**—Anteroposterior flaps formed by operating from without inward. Close flaps (suture; aseptic adhesive straps). Drain (seal inner part of wound in females to prevent contamination of urine and feces) externally.

**Dressing.**—Gauze, cotton, bandage.

**Prognosis.**—Guarded (death from shock).



## CHAPTER XVII.

### SURGERY OF FASCIA, TENDONS, MUSCLES.

**Implements.**—Scalpel, tenotome, scissors, hemostats (6), dissecting forceps, probe, gouge, director, retractors (small, sharp-pointed), needles, Esmarch bandage, tenaculum.

#### FASCIA.

**Contraction of the Palmar Fascia (Dupuytren's Contraction)** (Fig. 229).—Gives rise to permanent flexion of one or more fingers (ring and little fingers most often affected).



FIG. 229.—Dupuytren's contraction of the palmar fascia (Keen).

**Etiology.**—Traumatism (scars), occupation (coachman), rheumatism, gout, eczema, reflex.

**Pathology.**—Shortening, thickening, and induration of the palmar fascia; digital and subcutaneous prolongations.

**Symptoms.**—Characteristic position of firm flexion.

**Treatment.**—Massage, hot fomentations, hot-air baking, elastic extension splint and adhesive straps, extension (forcible), subcutaneous division of the fibrous bands, with the application of splints. Open operation with dissection.

**Prognosis.**—Favorable.

#### HAMMER-TOE.

**Definition.**—Contraction of a toe (usually the second), due to shortening of the prolongation of the plantar fascia

and lateral ligaments of the joint (Fig. 230). A similar condition affecting a finger may occur (hammer-finger).

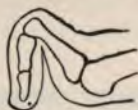


FIG. 230.—Hammer-toe.

**Treatment.**—Subcutaneous incision (forcible extension, with the application of a straight dorsal splint); osteotomy; excision; amputation.

**Prognosis.**—Favorable.

#### WEBBED FINGERS.

(Syndactylism.)

**Definition.**—A congenital malformation in which the fingers are more or less closely bound together.



FIG. 231.—Agnew's operation for webbed fingers (Pye).



FIG. 232.—Diday's operation for webbed fingers (Pye).

**Treatment.**—(a) Perforate the base of the web, inserting a thread, button, or metal ring. When cicatrized, complete the operation by incision through the undivided por-

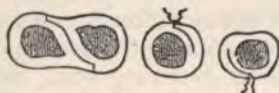


FIG. 233.—Transverse section, showing flaps before and after suture.

tion. (b) Elastic ligature. (c) Dissection of a V-shaped flap from between the knuckles and transplantation upon

the palm (Agnew) (Fig. 231). (*d*) Longitudinal flaps raised from opposite sides of the web and fingers; suture (Diday) (Figs. 232, 233).

**Prognosis.**—Good.

#### TRIGGER FINGERS.

**Definition.**—A deformity of the fingers characterized by sudden locking of the joints during movement.

**Etiology.**—Diathesis (rheumatism, gout); traumatism; work causing special fatigue of the fingers (knitters); tenosynovitis; "loose cartilage"; central nervous disease.

**Pathology.**—Thickening of the tendon or of its sheath has been observed.

**Symptoms.**—The condition is manifested upon movement of the fingers either of flexion or extension; motion usually painful.

**Treatment.**—Massage; electricity; incision; scarification (cautery).

**Prognosis.**—Guarded.

#### PARONYCHIA; WHITLOW; FELON.

(Panaris.)

**Definition.**—Septic infection of a finger or toe (rare).

**Etiology.**—Entrance of pus-germs, with or without a history of slight traumatism.

**Pathology.**—Inflammation may be mild or confined to the pulp of the finger (digital abscess); extending beneath the subcutaneous connective tissue, infection with more or less destruction of tendon-sheath, tendon, periosteum, and bone takes place.

**Symptoms.**—First symptom is a pricking sensation, followed by throbbing pain (increased by pendant position); tenderness; localized redness, heat, swelling. Constitutional disturbance may occur.

**Complications.**—Palmar abscess; lymphangitis; adenitis; gangrene; pyemia.

**Treatment.**—Early: Rest, elevation (sling), cold, fre-



quent immersion in water as hot as can be borne. If unimproved at the end of twenty-four hours, free incision.

**Internal Treatment.**—Purgative and tonic.

**Prognosis.**—Good if energetically treated.

### PALMAR ABSCESS.

**Definition.**—Pus-formation beneath the palmar fascia.

**Etiology.**—Extension of finger infection. More apt to occur when thumb or little finger is involved (synovial sheaths of these two fingers are connected with general palmar sheath) (Fig. 234).

**Pathology.**—Owing to dense structure, pus is—(a) Confined; (b) passes through the finger spaces to the back of the hand; (c) up the fore arm (beneath the annular ligament).

**Symptoms.**—Deep-seated inflammation; swelling of the back of the hand and fingers; fluctuation felt above the wrist. Fever.

**Complications.**—Necrosis; hemorrhage; pyemia.

**Treatment.**—Free incision, with drainage. Elevation; rest.

**Constitutional.**—Supportive.

**Prognosis.**—Guarded. Stiffness, if not deformity (claw-hand), commonly results.

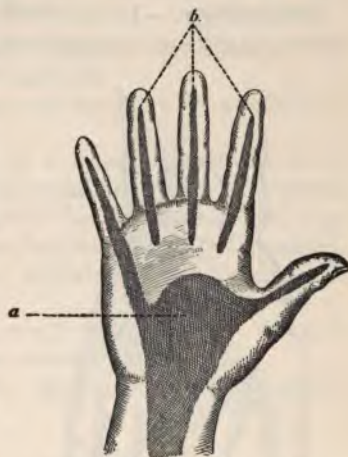


FIG. 234.—Synovial sheath of flexor tendons of fingers: a, General sheath common to the tendons in the palm and those of the thumb and little finger; b, separate sheath of the fore, middle, and ring fingers.

## TENDONS.

## TENOSYNOVITIS.

(Thecitis.)

**Definition.**—Inflammation of tendons and their sheaths. May be acute or chronic.

**Etiology.**—Acute: (a) Traumatism; (b) occupation; (c) infection; (d) rheumatism; (e) gout; (f) syphilis; (g) gonorrhea. Chronic: (a) Tuberculosis (Fig. 235).

**Pathology.**—In the acute forms inflammation with exudation, going on to suppuration in some cases.

Chronic (tuberculous) tenosynovitis (compound ganglion) gives rise to the formation of granulation tissue in and about the sheaths (fungoid); excess of fluid containing melon-seed bodies, riziform, free or attached (Fig. 236), with the presence of tubercle bacilli.

**Symptoms.**—Pain and swelling along the course of



FIG. 235.—Chronic tenosynovitis of the flexor tendon-sheaths on the front of the wrist.



FIG. 236.—Rice-kernel or melon-seed bodies from a case of chronic (tubercular) tenosynovitis.

the tendon; crepitation (crackling). Inflammation more marked if infection is present, with extension into the surrounding soft parts; fever. The chronic variety is usually painless and associated with near-by joint-disease.

**Treatment.**—**Acute forms (non-infected):** Rest, splint, bandaging, sling, strapping, cold, hot fomentations. Local application of tincture of iodine, unguentum hydrargyri, belladonna, ichthyol.

**Chronic.**—Aspiration; injection (iodoform emulsion); incision with drainage; erosion; excision.

**Prognosis.**—Good for non-infected acute forms. Guarded for chronic.

### GANGLION.

(Weeping Sinew.)

**Definition.**—A synovial cyst. Occurs as a small round or oval swelling upon extensor surfaces.

**Etiology.**—Obscure; history of traumatism sometimes given.

**Pathology.**—Development of a cystic outgrowth from the synovial lining of a tendon-sheath. Fluid contents clear; varies from serum to honey-like consistence and may contain melon-seed bodies (organized fibrinous exudate). Growth may be progressive or inhibited and subsequently disappear.

**Diagnosis.**—Presence of small hard tumor situated upon the back of the hand (commonest site).

**Treatment.**—Subcutaneous dispersion (compression, sudden blow); excision.

**Prognosis.**—Good.

### SUBCUTANEOUS RUPTURE OF TENDONS.

Follows sudden strain or violent effort.

**Symptoms.**—Sudden shock with pain; snap (felt and often heard); loss of function; gaping at the seat of injury; joint effusion (marked in the knee).

**Treatment.**—Rest in a position of relaxation and fixation of affected part (splints, adhesive plaster, and straps and bandaging). Open operation; suturing the divided ends (catgut or silk sutures); lengthening by splitting and turning down a detachment with suturing (Fig. 237); grafting to adjoining uninjured tendon having same general action



(tenorrhaphy). Secure fixation by rest of the parts by splinting (four to eight weeks). Employ Esmarch bandage

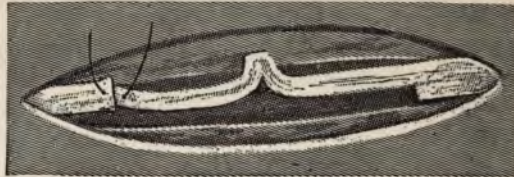


FIG. 237.—Czerny's method of tendon-suture when the ends cannot be approximated.

to facilitate operative procedures (clears the field of blood; compresses and elongates muscles).

**Prognosis.**—Favorable.

#### DISPLACEMENT (LUXATION) OF TENDONS.

Due to sudden muscular action or great violence. Rare unassociated with fracture or dislocation. May occur in humeral biceps (long head), peroneus, tibialis posticus.

**Treatment.**—Restoration by manipulation with fixation by compress and bandage; plaster-of-Paris-bandage dressing.

**Prognosis.**—Tendency to recur.

### MUSCLES.

#### MYOSITIS.

**Definition.**—Inflammation of a muscle.

**Etiology.**—Traumatism (sprain, blow); diathesis; cold; parasites.

**Symptoms.**—Pain (myalgic); tenderness (deep seated); swelling.

**Treatment.**—Rest; elevation; cold; hot fomentations.

**Prognosis.**—Favorable.

#### MYALGIA.

**Definition.**—Muscle pain; may be inflammatory or neuralgic.

**Etiology.**—Inflammation; acute infectious fevers; me-

tallic poisoning (lead, arsenic); syphilis; gonorrhea; rheumatism; gout.

**Treatment.**—Rest; elevation; hot fomentations; massage; electricity; counterirritation (mustard plaster; small blisters; cautery). Constitutional treatment if the cause be known.

**Prognosis.**—Usually favorable.

#### HERNIA OF MUSCLE.

**Definition.**—Protrusion of muscular tissue through its fascial envelop.

**Etiology.**—Circumscribed weakening of the deep fascia due to wounding.

**Symptoms.**—Hard-tumor formation manifested upon muscular contraction (disappearance upon relaxation), with determination of outline of weakened fascia.

**Treatment.**—Rest; compression (strapping, elastic bandage); incision with suturing (freshened fascial edges).

**Prognosis.**—Favorable.

#### CONTRACTURES OF MUSCLES.

**Definition.**—Persistent shortening.

**Etiology.**—Congenital; disease of central nervous system; traumatism; metallic poisoning; diathesis; infectious fevers; bone- or joint-disease; exposure to cold or wet.

#### TORTICOLLIS.

(Wry-neck; Caput Obstipum.)

**Symptoms.**—Contracted rigidity of one or more of the cervical muscles (sternocleidomastoid; trapezius; splenius) of one or both sides; head drawn down to the shoulder (if unilateral) or directly backward (if bilateral); atrophy of facial muscles may occur in long-standing cases (from disuse).

**Treatment.**—Friction; massage; electricity; hot fomentations; elastic extension apparatus; injections into the muscles (strychnin; atropin); forcible stretching under

general anesthesia; resection (subcutaneous); tenotomy (one or both heads of sternocleidomastoid just above the clavicle; by open or subcutaneous method); tendon lengthening (splitting the tendon, division at opposite ends with end-to-end suture of the sections by sliding); excision of spinal accessory nerve (chronic, spasmodic variety).

**After-treatment.**—Retention apparatus; padded paste-board collar; adhesive-plaster straps and bandage (head drawn toward opposite shoulder); plaster-of-Paris dressing.

**Prognosis.**—Favorable.

**Contractures of the muscles of the extremities** give rise usually to flexion of the arm, forearm, hand and fingers, hip and knee; extension of the foot.

**Treatment.**—Rest; massage; hot fomentations; hot-air baking; elastic and weight extension; forcible extension; tenotomy; myotomy (muscle section); tendon lengthening; constitutional treatment if cause be known.

**Prognosis.**—Guarded.

**Atrophy** may follow disuse, injury to bones, joints, or nerves, central nervous disease, acute infectious fevers poisoning.

**Treatment.**—Massage and electricity.

**Ossification** may occur (myositis ossificans).

**Prognosis.**—Guardedly unfavorable.

**Hypertrophy** due to excessive use (physiologic, pathologic, compensatory).

**Treatment.**—Rest, lessened use, compression.

**Prognosis.**—Guarded.



## CHAPTER XVIII.

### SURGERY OF THE CIRCULATORY SYSTEM.

#### LIGATION OF ARTERIES.

**Required For.**—(a) Hemorrhage; (b) aneurysm; (c) tumor (malignant growth).

**Implements.**—Hemostats (6), dissecting forceps, grooved director, aneurysm needle, tenaculum, retractors (sharp-pointed, dull), needles, Esmarch bandage.

#### INNOMINATE; BRACHIOCEPHALIC.

**Incision.**—V- or L-shaped, extending 3 inches (7.5 cm.) along the anterior border of the sternomastoid muscle from the sternum, and 3 inches (7.5 cm.) along the upper border of the clavicle. Divide the skin, superficial tissue, and small vessels; divide the sternohyoid and sternothyroid muscles; retract the inferior thyroid veins and fibrous lamina; reach the right common carotid artery. Trace down to the innominate artery; retract the left innominate vein, right innominate vein, internal jugular vein, and pneumogastric nerve. Pass the needle from below upward and inward.

**Danger.**—Secondary hemorrhage. Apply the ligature as high as possible to allow for sufficient clot-formation. Avoid the right pleural sac, the trachea, and cardiac nerves.

#### COMMON CAROTID.

**Guide** (Fig. 238).—Anterior border of the sternocleidomastoid muscle. A line drawn from the sternoclavicular articulation to a point midway between the angle of the jaw and the mastoid process.

**Incision.**—**High Operation.**—From near the angle of the jaw to a little below the cricoid cartilage.

**Low Operation.**—From a little above the cricoid cartilage downward two or three inches on a line with the anterior border of the sternomastoid muscle. Divide the skin, superficial fascia, platysma, deep fascia (upon a director);



FIG. 238.—Position of the line of incision for ligation of temporal, facial, lingual, common carotid (above the omohyoid), subclavian, axillary (first portion), and internal mammary arteries.

retract veins and cellular tissue; descendens hypoglossi nerve; reach sheath of vessel. Open the vessel-sheath, pass the needle from without inward. Avoid the jugular vein and pneumogastric nerve.

#### INTERNAL CAROTID.

**Guide.**—Anterior border of the sternomastoid muscle.

**Incision.**—From the angle of the jaw to the upper border of the thyroid cartilage. Divide the skin, superficial fascia, platysma, deep fascia; retract the sternomastoid muscle, superior thyroid, lingual and facial veins, lymphatic glands, and cellular tissue. Reach the hypoglossal nerve (deep guide). Pass the needle from without inward.

Overgrowth of the carotid body at the bifurcation of the common carotid artery occurs (rare), giving rise to **tumor of the carotid**. Is of slow growth and in some cases consists of a perithelioma.

**Treatment.**—Excision; ligation of the artery may be required.

**Prognosis.**—Guarded.

#### VERTEBRAL ARTERY.

**Guide.**—Transverse process of the sixth cervical vertebra.

**Incision.**—Parallel to either the anterior or posterior border of the sternomastoid muscle, above the clavicle. Divide the skin, superficial fascia, platysma, deep fascia; retract the sternomastoid muscle; reach the anterior tubercle of the transverse process of the sixth cervical vertebra (carotid tubercle) (deep guide). Divide a deep layer of fascia. Reach the space between the scalenus anticus and longus coli muscles. Vertebral artery and vein lie in the interspace. Retract the vein. Pass the needle from without inward.

#### SUPERIOR THYROID ARTERY.

**Incision.**—From the side of the hyoid bone, obliquely downward and outward to the anterior border of the sternomastoid muscle. Divide the skin, superficial fascia, platysma, deep fascia. Retract cellular tissue and expose the vessel between the larynx and the great vessels of the neck. Pass the needle from above downward.

#### INFERIOR THYROID ARTERY.

**Incision.**—Parallel to the anterior border of the sternomastoid muscle, ending 1 inch (2.5 cm.) above the clavicle. Divide skin, superficial fascia, platysma, deep fascia. Retract the sternomastoid muscle. Divide the facial lamina. Retract the carotid artery and jugular vein. Feel for the carotid tubercle (deep guide); retract cellular tissue and expose the inferior thyroid artery. Pass the needle between artery and vein.

#### LINGUAL ARTERY.

**Incision.**—One inch (2.5 cm.) long, downward and forward from behind the cornu of the hyoid bone. Divide the skin, superficial fascia, platysma, deep fascia. Retract the



submaxillary gland. Divide the fibers of the hyoglossus muscle midway between the hypoglossal nerve and the hyoid bone. Expose the vessel. Pass the needle from above downward.

#### FACIAL.

**Incision.**—Horizontal, along the edge of the lower jaw from the anterior border of the masseter muscle. Divide the skin, superficial fascia, platysma, deep fascia. Retract vein. Pass the needle from behind forward.

#### TEMPORAL ARTERY.

**Incision.**—Transverse, 1 inch (2.5 cm.) in length, from the tragus of the ear forward over the zygomatic arch. Divide the skin. Expose and retract subcutaneous fibrous tissue. Expose the temporal artery (temporal vein lies nearer the ear). Pass the needle from behind forward.

#### OCCIPITAL ARTERY.

**Incision.**—Transverse, 1 inch (2.5 cm.) long, just below and parallel to the mastoid process. Divide the skin, superficial fascia, insertion of sternomastoid muscle, aponeurosis of splenius muscle. Feel for digastric groove (deep guide). Retract the digastric muscle. Expose the artery. Pass the needle from within outward.

#### SUBCLAVIAN ARTERY.

**Guide.**—A line parallel and half an inch (1.25 cm.) above the clavicle from the outer edge of the sternomastoid muscle to the inner edge of the trapezius muscle.

**Deep Guides.**—Tubercle on the first rib; the outer border of the scalenus anticus muscle.

**Incision.**—For the First Portion.—V- or L-shaped, extending 3 inches (7.5 cm.) upward along the anterior border of the sternomastoid muscle from the sternum, and a like distance along the upper border of the clavicle. Divide the skin, superficial fascia, platysma, deep fascia, sternal and clavicular ends of the sternomastoid muscle. Retract cell-

ular tissue, small vessels. Divide the sternohyoid and sternothyroid muscles. Retract the inferior thyroid veins, fibrous lamina. Reach the common carotid artery. Trace down to the innominate (arch of the aorta upon the left side). Retract the pneumogastric, phrenic nerves, recurrent laryngeal nerve, innominate vein, inferior thyroid vein (right side), internal jugular vein. Pass needle from below upward and inward.

**For Third Portion.**—From the outer edge of the sternomastoid muscle to the inner border of the trapezius muscle (cutting down to the clavicle with the skin drawn downward). Retract cellular tissue, suprascapular and transverse cervical veins, tendon of the omohyoid muscle, suprascapular artery. Feel for the outer edge of the scalenus anticus muscle (deep guide). Trace to the first rib and expose the vessels. Subclavian vein in front, artery behind the muscle (omohyoid). Pass the needle from below upward and from before backward.

#### INTERNAL MAMMARY ARTERY.

**Guide.**—A line parallel and half an inch (1.25 cm.) beyond the edge of the sternum.

**Incision.**—Transverse in second intercostal space. Divide skin, superficial fascia, deep fascia, intercostal muscles. Pass the needle from within outward.

#### INTERCOSTALS.

**Guide.**—Lower border of the ribs.

**Incision.**—Transverse. Divide the skin, superficial fascia, intercostal muscles. Retract muscle-fibers and fascial sheath from lower border of rib. Expose the artery lying in a groove. Pass the needle from above downward.

#### AXILLARY ARTERY.

**Guide** (Fig. 239).—**First Portion.**—Arm at right angles to the chest, abducted. A line drawn from the middle of the clavicle to the point where the tendon of the pectoralis major muscle crosses the prominence caused by the coraco-

brachialis as it emerges from beneath the anterior fold of the axillary space.

**Third Portion.**—In the axillary space at the junction of the middle and anterior third, close to the border of the coracobrachialis muscle.

**Incision.**—**First Portion.**—Curved or straight, extending below the clavicle from the sternoclavicular articulation outward toward the deltoid muscle. Divide the skin, superficial fascia, deep fascia, fibers of the pectoralis major muscle. Expose the costocoracoid membrane. Retract cephalic and axillary veins to reach the artery. Pass the needle from below upward.

**Third Portion.**—Arm raised and abducted. Through the floor of the axilla, extending for 2 or 3 inches (5-7.5 cm.)



FIG. 239.—Lines of incision for ligation of the axillary (third portion), brachial, radial, and ulnar arteries.

on a line a little nearer the anterior than the posterior folds of the axillary space. Divide the skin, subcutaneous tissue, deep fascia, areolar tissue. Expose and retract the median nerve, axillary vein, fasciculus of latissimus dorsi muscle (if present). Flex the arm to secure relaxation. Expose the axillary artery. Pass the needle from within outward.

#### BRACHIAL ARTERY.

**Guide.**—A line drawn from the junction of the anterior and middle thirds of the axillary space to a point midway between the condyles of the humerus. Inner border of the biceps muscle.

**Incision.**—**Upper Third.**—Arm raised and abducted.



Extending 2 inches (5 cm.) along the inner edge of the coracobrachialis muscle. Divide the skin, fascia. Retract the cellular tissue, internal cutaneous nerve, basilic vein, median cutaneous nerve, venæ comites. Expose the artery. Pass the needle from within outward.

**Middle Third.**—Along the margin of the biceps muscle. Divide the skin and fascia. Retract the median nerve and venæ comites. Expose the artery. Pass the needle from within outward.

**Lower Third.**—Along the inner border of the tendon of the biceps muscle. Divide the skin, superficial fascia, bicipital aponeurosis. Reach the artery. Retract the veins. Pass the needle from within outward.

#### RADIAL ARTERY.

**Guide.**—A line drawn from the outer edge of the biceps tendon at the bend of the elbow to the inner side of the styloid process of the radius.

**Incision.**—**Upper Third.**—Two to 3 inches (5–7.5 cm.) in length. Divide the skin and superficial fascia. Retract the superficial veins. Reach the deep fascia. Divide the fascia at the ulnar side of the supinator longus muscle. Reach the pronator radii teres muscle. Retract cellular tissue and expose the artery. Retract the veins. Pass the needle from without inward.

**Middle Third.**—Two inches (5 cm.) long. Divide the skin, superficial fascia, deep fascia. Retract cellular tissue. Reach and expose the artery lying in the interspace between the flexor carpi radialis and supinator longus muscles. Avoid the radial nerve. Pass the needle from without inward.

**Lower Third.**—Two inches (5 cm.) long, ending  $1\frac{1}{2}$  inches (3.75 cm.) above the wrist. Divide the skin, superficial fascia, and deep fascia. Expose the artery, lying between the tendons of the flexor carpi radialis (inner side) and supinator longus (outer side) muscles. Retract the veins. Pass the needle from either side.

**At the Base of the Thumb.**—One inch (2.5 cm.) long between the tendons of the extensor ossis metacarpi pollicis

and extensor primi internodii pollicis (outer side), extensor secundi internodii pollicis (inner side). Divide the skin and superficial fascia. Retract the radial vein. Divide the deep fascia. Expose the artery. Pass the needle from either side.

#### ULNAR ARTERY.

**Guide.**—**Middle and Lower Thirds.**—A line drawn from the inner condyle of the humerus to the radial side of the pisiform bone.

**Upper Third.**—A line drawn from the middle of the bend of the elbow to meet the above line at the junction of the middle and upper thirds of the ulnar side of the forearm.

**Incision.**—Extending 3 inches (7.5 cm.) downward from a point 4 inches (10 cm.) below the condyle of the humerus. Divide the skin and superficial fascia. Expose the deep fascia and interspace between the flexor carpi ulnaris and the flexor sublimis digitorum muscles. Retract the flexor sublimis digitorum and expose the artery. Avoid the ulnar nerve. Pass the needle from within outward.

**Lower Third.**—Two inches (5 cm.) long, a little to the radial side of the tendon of the flexor carpi ulnaris. Divide the skin, superficial fascia, and deep fascia. Expose the artery lying between the tendons of the flexor carpi ulnaris and flexor sublimis digitorum. Retract the veins and ulnar nerve. Pass the needle from within outward.

#### INTEROSSEOUS ARTERY.

**Guide.**—A line drawn from the middle of the bend of the elbow to meet a second line similar to that for the lower and middle thirds of the ulnar artery.

**Incision.**—Three inches (7.5 cm.) long, beginning 2 inches (5 cm.) below the bend of the elbow. Divide the skin, superficial fascia, deep fascia, intermuscular septa. Retract the flexor profundus digitorum and the flexor longus pollicis muscles. Expose the artery. Avoid the interosseous branch of the median nerve. Pass the needle from within outward.

## PALMAR ARCHES.

**Guide** (Fig. 240).—**Superficial.**—A curved line drawn across the palm from the pisiform bone along the palmar border of the outstretched thumb.

**Incision.**—**Longitudinal.**—Divide the skin, superficial fascia, subcutaneous cellular tissue, palmaris brevis muscle, palmar fascia. Avoid branches of the median and ulnar nerves. Pass the needle from above downward. Tie both ends of vessel if divided.

**Deep Arch.**—Parallel line drawn from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch (0.625–1.25 cm.) above (wrist side) the line for the superficial arch. Divide the skin, superficial fascia, cellular tissue, palmar fascia. Retract the flexor tendons and nerves. Reach the artery lying upon the interosseous muscles and bases of the metacarpal bones. May also be reached from the back of the hand by resecting the upper part of the third metacarpal bone. Pass the needle from above downward.



FIG. 240.—The figure shows the position of the superficial palmar arch, and the direction and position of the wound which would have to be made in order to reach it.

## ABDOMINAL AORTA.

**Incision.**—Four inches (10 cm.) long, a little to the left of the median line, extending above and below the umbilicus. Divide the skin, superficial fascia, areolar tissue, deep fascia, aponeurosis of the external oblique, internal oblique, transversalis muscles, transversalis fascia, peritoneum. Displace omentum and intestines. Divide the deep layer of the peritoneum. Retract the sympathetic nerves and vena cava. Expose the artery. Pass the needle from left to right and from behind forward.



## COMMON ILIAC ARTERY.

**Guide.**—A line drawn from a little below and to the left of the umbilicus to the middle of Poupart's ligament.

**Incision.**—From 4 to 6 inches (10–15 cm.), long, curving upward and outward from half an inch (1.25 cm.) above Poupart's ligament, from the crest of the ilium. Divide the skin, superficial fascia, aponeurosis of external oblique, fibers of internal oblique, transversalis muscle, transversalis fascia. Expose and retract the border of the peritoneum. Trace the common iliac up from the internal iliac artery. Expose by retracting cellular tissue. Avoid the iliac vein. Pass the needle from within outward.

## INTERNAL ILIAC ARTERY.

**Incision** (Fig. 241).—Three to 5 inches (7.5–12.5 cm.) long in the same general direction as for the common iliac

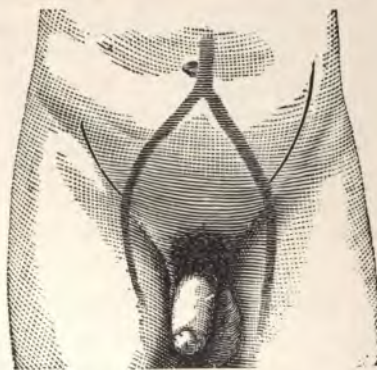


FIG. 241.—Direction of the common and external iliac arteries, and the positions of the superficial incisions adopted for their ligation. On the right side is that for the external iliac, and on the left side that for the common iliac artery (MacCormac).

artery. Expose and retract the border of the peritoneum. Expose the internal iliac artery. Avoid the iliac vein. Pass the needle from within outward.

## EXTERNAL ILIAC ARTERY.

**Incision.**—Three to 4 inches (7.5–10 cm.) long, extending upward and outward from a point  $\frac{1}{2}$  inch (1.25 cm.) above the middle of Poupart's ligament. Expose and retract the lower border of the peritoneum. Reach the inner border of psoas muscle. Expose the artery. Avoid the anterior crural nerve, external iliac vein, genito-urinary nerve. Pass the needle from within outward.

## GLUTEAL ARTERY.

**Guide** (Fig. 242).—A line drawn from the posterior superior spine of the ilium to the middle of the great trochanter.

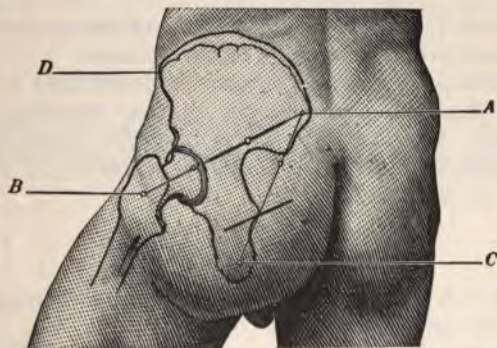


FIG. 242.—Position and direction of the superficial incisions which must be made in order to secure the gluteal artery and the sciatic and pudic arteries: *A*, Posterior superior iliac spine; *B*, great trochanter; *C*, tuberosity of the ischium; *D*, anterior superior iliac spine; *AB*, iliotrochanteric line, divided into thirds. This line corresponds in direction with the fibers of the gluteus maximus muscle. The incision to reach the gluteal artery is indicated by the darker portion of the line. Its center is at the junction of the upper and middle thirds of the iliotrochanteric line, and exactly corresponds with the point of emergence of the gluteal artery from the great sciatic notch. *AC*, ilio-ischiatic line. The incision to reach the sciatic artery and internal pudic is indicated by the lower dark line. It also is to be made in the direction of the fibers of the gluteus maximus muscles. The center of the wound corresponds to the junction of the lower with the middle third of the ilio-ischiatic line.

**Incision.**—Three to 4 inches (7.5–10 cm.) long. Divide the skin, superficial fascia, areolar tissue, fibers of gluteus maximus muscle, deep fascia. Reach the pyriformis muscle.

Expose the artery at the upper border of the great sacro-sciatic notch. Pass the needle from within outward.

#### SCIATIC.

**Guide.**—A line drawn from the posterior superior spine of the ilium to the tuberosity of the ischium.

**Incision.**—Three to 4 inches (7.5–10 cm.) long. Divide the skin, fascia, areolar tissue, gluteus maximus muscle, deep fascia. Reach the pyriformis muscle. Expose the artery lying beneath the lower border of the muscle. Avoid the internal pudic artery, veins, sciatic nerve. Pass the needle from within outward.

#### INTERNAL PUDIC ARTERY.

**Guide.**—A line drawn from the posterior superior spine of the ilium to the tuberosity of the ischium.

**Incision.**—Three to 4 inches (7.5–10 cm.) long. Divide the skin, superficial fascia, gluteus maximus muscle, deep fascia. Reach the pyriformis muscle, lower border of great sacrosciatic notch. Expose the artery. Pass the needle from within outward.

#### DEEP EPIGASTRIC ARTERY.

**Guide.**—A line drawn from the middle of Poupart's ligament to the umbilicus.

**Incision.**—Parallel to Poupart's ligament, 1 inch (2.5 cm.) above it. Divide the skin, superficial fascia, deep fascia, aponeurosis of external oblique, internal oblique muscle, transversalis muscle, transversalis fascia. Reach the artery. Avoid veins, the peritoneum. Pass the needle from within outward.

#### CIRCUMFLEX ILIAC ARTERY.

**Incision.**—Parallel to and just above the outer end of Poupart's ligament and the crest of the ilium. Divide the skin, superficial and deep fasciæ, aponeurosis of external oblique, internal oblique muscle, transversalis muscle, trans-



versalis fascia. Reach the artery. Pass the needle from within outward.

### COMMON FEMORAL; DEEP (PROFUNDA) FEMORAL ARTERY.

**Guide.**—A line drawn from a point midway between the anterior superior spine of the ilium to the spine of the pubis, to the tuberosity upon the inner condyle of the femur (adductor tubercle).

**Incision.**—Directly downward from Poupart's ligament. Divide skin, superficial fascia, fascia lata. Retract lymphatic glands, cellular tissue. Expose and retract the inner edge of the sartorius muscle. Expose the sheath of the vessels. Open upon the outer side. Avoid the femoral vein, saphenous vein, anterior crural nerve, genito-urinary nerve. Pass the needle from within outward.

### SUPERFICIAL FEMORAL ARTERY.

**Incision** (Fig. 243).—Begin 3 inches (7.5 cm.) below Poupart's ligament, extending for 3 inches (7.5 cm.) on the



FIG. 243.—The lines indicate the incisions to be made for the ligature of the common femoral, of the femoral in Scarpa's triangle and in Hunter's canal, and of the posterior tibial in the calf and behind the malleolus (MacCormac).

guide line. Divide the skin, superficial fascia. Retract the superficial veins. Divide the deep fascia. Retract lymphatic glands, sartorius muscle. Expose the vessel-sheath. Open

the sheath upon its outer side. Avoid the femoral vein, anterior crural nerve, long saphenous nerve, nerve to vastus internus muscle. Pass the needle from within outward.

**On the Middle of the Thigh.**—Three or 4 inches (7.5–10 cm.) long at the middle of the thigh upon the guide line. Divide the skin, superficial fascia, deep fascia. Expose and retract the sartorius muscle. Expose the vessel-sheath. Avoid long saphenous nerve, saphenous vein. Pass the needle from within outward.

**In Hunter's Canal.**—Three inches (7.5 cm.) long, a finger's breadth internal to the guide line, at the junction of the middle and lower thirds of the thigh. Divide the skin, superficial fascia. Retract the saphenous vein. Divide the fascia lata. Retract the sartorius muscle. Divide the aponeurosis (anterior wall of Hunter's canal). Retract the femoral vein. Pass the needle from without inward.

#### POPLITEAL.

**Guide.**—A line drawn from the outer border of the semimembranosus muscle at the junction of the middle and lower thirds of the thigh, obliquely downward to the middle of the popliteal space; thence downward to the level of a line drawn through the tubercle of the tibia.

**Incision.**—Three or 4 inches (7.5–10 cm.) along the external border of the semimembranosus muscle. Divide the skin, superficial fascia. Retract the saphenous vein. Divide the deep fascia, cellular tissue. Reach and retract internal popliteal nerve, popliteal vein. Expose the artery. Pass the needle from without inward.

#### ANTERIOR TIBIAL ARTERY.

**Guide** (Fig. 244).—A line drawn from the inner side of the head of the fibula to midway between the two malleoli. The artery comes in front of the interosseous membrane,  $1\frac{1}{2}$  inches below the level of the head of the fibula.

**Incision.**—**Upper Third.**—Two to 3 inches (5–7.5 cm.) long. Divide the skin, superficial fascia, deep fascia. Retract the tibialis anticus and extensor longus digitorum

muscles. Reach the artery lying in the interspace. Retract the anterior tibial nerve, anterior tibial veins. Pass the needle from without inward.

**Middle Third.**—Three (7.5 cm.) inches long. Divide the skin, superficial fascia, deep fascia. Reach and retract between tibialis anticus, extensor longus digitorum. Expose extensor proprius pollicis. Retract the artery lying between the extensor proprius pollicis and tibialis anticus muscles. Avoid the anterior tibial nerve, veins. Pass the needle from without inward.

**Lower Third.**—Two inches (5 cm.) long, ending one inch (2.5 cm.) above the ankle-joint. Divide the skin, superficial fascia, deep fascia. Retract and reach the extensor proprius pollicis muscle tendon (second tendon from the tibia). Reach the artery lying between the extensor proprius pollicis tendon and extensor longus digitorum tendon. Retract nerves, veins. Pass the needle from without inward.



FIG. 244.—Position and direction of the incisions which may be made to ligate the anterior tibial and dorsalis pedis arteries (MacCormac).

#### DORSALIS PEDIS ARTERY.

**Guide.**—A line drawn upon the dorsum of the foot from the center of the space between the two malleoli to the back of the first metatarsal space.

**Incision.**—Two inches (5 cm.) long on the fibular side of the tendon of the extensor proprius pollicis. Divide the skin, superficial fascia, deep fascia. Retract the inner tendon of the short extensor of the toes. Expose the artery. Avoid nerve, veins. Pass the needle from without inward.



## POSTERIOR TIBIAL ARTERY.

**Guide.**—A line drawn from a point 1 inch (2.5 cm.) below the center of the popliteal space to midway between the tip of the internal malleolus and the center of the convexity of the heel.

**Incision.**—**Upper Third.**—Three inches (7.5 cm.) long. Divide the skin and superficial fascia. Retract the veins. Divide the deep fascia and origin of the soleus muscle from the tibia. Reach the lamina and sheath of fascia and tibialis posticus muscle. Expose the artery. Avoid the posterior tibial nerve, veins. Pass the needle from without inward.

**Middle Third.**—Three inches (7.5 cm.) long. Divide the skin, superficial fascia, deep fascia. Reach the inner edge of the soleus muscle. Retract and expose the vessels. Avoid the nerve, veins. Pass the needle from without inward.

**Lower Third, Behind the Inner Malleolus.**—Curved, 2 inches (5 cm.) long midway between the tendo Achillis and the internal malleolus. Divide the skin, superficial fascia, deep fascia on a grooved director. Retract and expose the artery lying between the tendons of the tibialis posticus, flexor longus digitorum, and the posterior tibial nerve and tendon of the flexor longus pollicis. Avoid the veins. Pass the needle from without inward.

## PERONEAL ARTERY.

**Guide.**—A line drawn from 1 inch (2.5 cm.) below the center of the popliteal space to a point midway between the external malleolus and the center of the convexity of the heel.

**Incision.**—Three inches (7.5 cm.) long. Divide the skin, superficial fascia. Retract the veins. Divide the deep fascial sheath. Retract the tibialis posticus, flexor longus pollicis muscles. Reach the artery. Avoid the veins. Pass the needle from within outward.

## PLANTAR ARCH.

**Guide.**—A line drawn from a point one finger's breadth internal to the tuberosity of the fifth metatarsal bone transversely across the foot to the back of the first interosseous space.

Delorme has shown that the vessels may be ligated from the dorsum of the foot by resecting a portion of one of the three middle metatarsal bones.

## HEMORRHAGE.

May be: (a) Primary (immediate), due to division or wound of vessel; (b) intermediate, consecutive, reactionary (due to slipping of ligature, increase of blood-pressure, or movement of the part, disturbing clots); (c) secondary, due to disease of vessel-walls,—diathesis, visceral disease,—sloughing, too early absorption of catgut ligature.

**Symptoms.**—Pallid face and mucous membranes, lividity of lips, blueness beneath the finger-nails, playing of alæ of the nose, nausea, vomiting, clammy perspiration, fall of temperature, rapid thready pulse, rapid and irregular respiration, tinnitus aurium, flashes of light before the eyes, unconsciousness, convulsion, delirium, exhaustion, collapse. After hemorrhage has ceased and reaction takes place have elevation of temperature (hemorrhagic fever), due to absorption of fibrous ferment and nerve irritation.

**Treatment.**—**Primary.**—*Local.*—

Forceps, position, angiotribe, suture, ligature (Fig. 245), torsion (acupressure), pressure (finger, tourniquet, Spanish windlass, Esmarch bandage, packing and bandage—remove an Esmarch bandage slowly so as to catch the bleeding points



FIG. 245.—Anastomoses three months after ligation of the femoral artery of a dog (Porta).

and also prevent the too quick return of blood-pressure to the part), heat (hot water, 115° to 140° F., cautery), cold, styptics: Thyroid extract, adrenalin, tannin in collodion, perchlorid of iron, tincture of benzoin, melted paraffin (for use in bone hemorrhage). Under the name of Cunningham's wax the following may be used to stop bleeding from bone:

- R. White wax . . . . . ʒij (8 gm.).  
     Castor oil . . . . . fʒj (4 c.c.).  
 M. Heat (to sterilize).

**General.**—Rest, transfusion. Drugs: Ether, fʒj-ij (4-8 c.c.) (hypodermically); opium, gr.  $\frac{1}{8}$  (0.008 gm.); digitalis, 5-20 min. (0.333-1.333 c.c.); atropin, gr.  $\frac{1}{150}$  (0.0004 gm.); tannic acid, gr. iij-xx (0.199-1.333 gm.); gallic acid, gr. v-xxx (0.333-2.0 gm.); oil of erigeron, 5-20 drops (0.333-1.333 c.c.); fluid extract of ergot, fʒj-ij (4-8 c.c.).

**Intermediate.**—Apply ligatures—(a) only when bleeding; (b) tie in the wound; (c) tie both ends.

**Secondary.**—If slight (first time) may interfere locally; compression, elevation, tourniquet, Esmarch bandage. If severe or second time, must interfere locally. Open the wound, turn out clots—(a) tie both ends of vessels; (b) in flap; (c) main artery; (d) reamputation (stump hemorrhage).

**Prognosis.**—Rapidity of loss is more dangerous than the quantity. Extremes of life bear hemorrhage badly, but recuperation is rapid in the young.

## TRANSFUSION.

**Definition.**—Injection of blood from one person (or normal salt solution) into the vessels of another (Fig. 246). Required for (a) shock; (b) profuse hemorrhage.

**Direct Blood Transfusion.**—*Implements.*—1. A small rubber tube, 12, to 18 inches in length, fitted with a bulb in the middle, tapering metal tube-tips at the ends (Aveling's apparatus) (Fig. 247), scalpel, scissors, hemostats (6), dissecting forceps, needle.

*Method.*—Fill the bulb and tubing with warm salt solu-





FIG. 246.—Intravenous injection.

tion (1 dram (4 gm.) of salt dissolved in one pint (512 c.c.) of warm sterile water) to prevent the entrance of air. Expose by dissecting a vein of the patient and of the donor

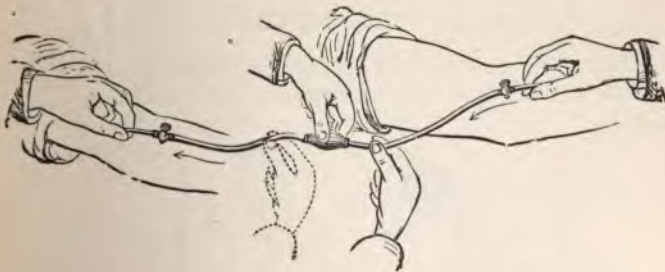


FIG. 247.—Aveling's apparatus for immediate transfusion.

near the bends of the elbows. Insert the metal tips in the veins, pointing toward the body of the patient, toward the fingers of the donor. Accomplish the transfer by slowly compressing the bulb after occluding the tube upon the

donor's side with a hemostat. Continue by applying a hemostat to the tube upon the patient's side, releasing that upon the donor's. When the bulb has refilled, repeat the first procedure. Regulate the quantity admitted by the condition of the pulse.

2. **Saline Transfusion.**—*Implements.*—Twenty inches (50 cm.) of small rubber tubing fitted at one end to a glass funnel, a tapering metal tubing-tip at the other.

*Method.*—Fill the funnel, tube, and tip with warm saline solution (0.7 per cent. made by dissolving 3j (4 gm.) of sodium chlorid in Oj (5.12 c.c.) of sterile water) (prevents the entrance of air). Insert the tip into one of the veins near the bend of the elbow (exposed by dissection). Accomplish transfusion by elevating the funnel.

3. **Saline Injection (Hypodermoclysis).**—Injection of warm saline solution into the cellular tissue (buttocks).

*Method.*—(a) Aspirating syringe; (b) tube and funnel apparatus.

4. **Saline Rectal Injection.**—*Method.*—Injection of from one to four quarts (1024 c.c.—4.1 L.) of hot saline solution or plain hot sterile water high into the bowel by means of the funnel and tube apparatus.

#### AUTOTRANSFUSION.

Application of Esmarch, muslin bandage (Fig. 248), Spanish windlass to the extremities in emergency hemorrhage.



FIG. 248.—Autotransfusion (Esmarch).

## ARTERITIS.

**Definition.**—Inflammation of an artery.

**Morphology.**—(1) *Acute, Rarely Primary.*—(a) Endarteritis (endothelial); (b) mesarteritis (medial involvement); (c) periarteritis (adventitia involved from extension from periarterial tissues). (2) *Chronic.*—(a) Atheroma (softening, arteriosclerosis).

**Etiology.**—(1) *Acute.*—(a) Infecting or poisonous embolus; (b) extension from inflammation of surrounding tissues. (2) *Chronic.*—Diathesis, alcoholism, traumatism, nephritis.

**Pathology.**—(a) *Acute.*—Gives rise to suppurating inflammation terminating in abscess. Thrombus formation usually occludes vessel lumen, preventing hemorrhage. (b) *Chronic.*—Endothelial lining first affected by chronic inflammation; fatty, caseous, calcareous degeneration; ulceration. Middle coat later involved, resulting in calcification: (a) Lamina calcification (plates); (b) annular calcification (concentric deposit); (c) tubular calcification (extended concentric deposit). Adventitia becomes swollen, hypertrophied, inelastic. Gangrene, from occlusion of vessel lumen, may occur.

**Symptoms.**—(1) *Acute*, sharp pain and tenderness along the course of the vessel. (2) *Chronic*, manifested in terminal (temporal, radial) vessels, characteristic, hard, roughened, inelastic condition (pipe-stem).

**Complications and Sequelæ.**—Apoplexy, aneurysm, gangrene.

**Treatment.**—Rest, treat the diathesis (iodid of potassium, gr. v three times a day, for absorbent effect); nitroglycerin to overcome high arterial tension.

**Prognosis.**—Guardedly unfavorable.

## ANEURYSM.

**Definition.**—A disease of arteries characterized by a circumscribed dilatation of one or more of the arterial coats.

**Morphology.**—I. *Idiopathic.*—(a) *Tubular (fusiform)*



(Fig. 249), in which there is simultaneous dilatation and elongation of all the coats of the artery (aorta, iliac, basilar).

(b) *Sacculated*—sac-like formations upon the side of an artery, or upon a preëxisting tubular aneurysm (Fig. 250).



FIG. 249.—Tubulated or fusiform aneurysm.

May communicate with the vessel by a comparatively small opening (mouth). May be *true* (made up of all the coats); *false* (commonest form), in which inner and a portion of the middle coat having given way, sac-wall is formed by the outer thickened coat and the outer layers of the media.



FIG. 250.—Sacculated aneurysm.

*False aneurysm* may be *circumscribed* (sac entire), or *diffuse* (sac ruptured and blood widely diffused or confined by adventitious connective tissue).

(c) *Dissecting*, in which the blood makes its way between

the coats of the artery (Fig. 251). (1) May form a sac; (2) dissect up the coats and rupture externally (Fig. 252); (3) dissect up the coats and reënter the vessel.

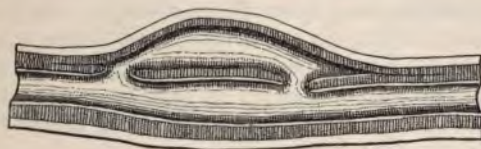


FIG. 251.—Plan of a dissecting aneurysm (Holmes).

**2. Traumatic.**—The sac is formed of inflammatory lymph and connective tissue.

**Etiology.**—(1) **Predisposing Causes.**—Male sex, middle life, intermittent hard work, syphilis, gout, rheumatism, poisoning (lead, alcohol).



FIG. 252.—Dissecting aneurysm of the aorta. The aneurysm began near the aortic valves and extended to the iliac branches, converting the aorta into a double tube: *a*, transverse; *b*, longitudinal section (Stengel).

**2. Active Causes**—Sudden strain, wounds, blows.

**Circumscribed Traumatic Aneurysm.**—Result of yielding of healed cicatrix after a punctured wound of the artery. Aneurysmal hernia, protrusion of the inner coats through a

punctured or lacerated wound of the outer coat of the artery.

**Pathology.**—Aneurysm may be single, double, multiple (aneurysmal diathesis); may vary in size from a pea to a child's head, depending upon the resistance. A true aneurysm consists of: (1) External or adventitious sac (result of inflammation and compression of surrounding connective tissue); (2) true sac, made up of one or more of the degenerated coats of the artery; (3) clot, often firm and laminated (concentric layers).

**Symptoms.**—Often presents a rounded, oval, pulsating tumor, dilatation of superficial veins, edema (pressure upon deep veins), glossy skin, expansile pulsation (heaving), systolic thrill, tracheal tugging, circumscribed dulness, increased resistance, bruit (systolic, accentuation of heart-sounds). Pulse may be delayed or diminished in one radial or femoral, due to diffusion or partial occlusion of arterial orifice. Dyspnea (pressure upon trachea, bronchi, recurrent laryngeal nerve spasm or paralysis of vocal cords); cough (metallic), due to pressure upon recurrent laryngeal nerve, pain, from pressure upon bones, nerve irritation; dysphagia (difficult swallowing), from pressure upon esophagus; unilateral pupillary contraction or dilatation; facial paralysis; deafness.

**Diagnosis From.**—1. **Solid Tumor.**—Mediastinal growth. Pulsating, not expansile, up and down; no bruit; no tracheal tugging; more impairment of general health.

2. **Expansile Aorta.**—Occurs in neurotic women; no bruit or pressure-symptoms.

3. **Thoracic Effusion.**—By history; no bruit; pulsation not expansile.

4. **Abscess.**—History, introduction of hypodermic needle (blood if aneurysm; pus if abscess).

**Treatment.**—1. **Medical.**—(a) Absolute rest in bed two to four months; (b) dry diet—Tufnell meals: Breakfast and supper, bread and butter  $\bar{z}$ ij (64 gm.); milk,  $\bar{f}$ zj (64 c.c.); dinner, meat,  $\bar{z}$ ij (96 gm.); vegetables,  $\bar{z}$ ij (96 gm.); water,  $\bar{f}$ zj (96 c.c.); (c) drugs: Potassium iodid, gr. x-xx (0.666-1.333 gm.) three times daily. When the pulse is very strong,



give aconite, veratrum viride; venesection. Relieve pain with ice-bag, morphin.

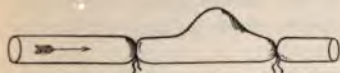


FIG. 253.—Old operation of Antyllus for aneurysm.

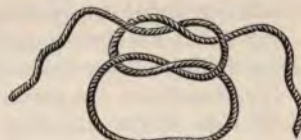


FIG. 254.—Reef-knot.

2. **Surgical.**—(a) *Compression* (direct upon aneurysm); indirectly above (proximal) or below (distal) sac. May be



FIG. 255.—Anel's operation for aneurysm.

instrumental, digital, elastic bandage, flexion. (b) *Rapid pressure* (instrumental, under anesthesia).

(c) *Ligation.*—(1) *Antyllus or Old Operation.*—Expose

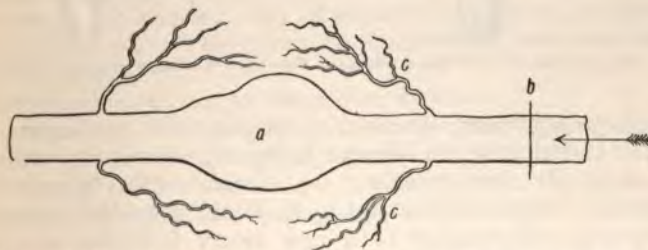


FIG. 256.—Hunter's method of ligating for aneurysm: *a*, The aneurysm; *b*, the point of ligation; *c*, the branches between the aneurysm and the ligature. The arrow shows the direction of the blood-current.

the vessel, ligate upon each side of the aneurysm, open the sac, and turn out the clot (Fig. 253, 254).

(2) *Anel's Operation.*—Expose and tie the main artery (Fig. 255).

*Implements.*—Tourniquet, hemostats (8), scalpels, dissecting forceps, scissors, grooved director, retractors, aneurysm needles, tenaculum, cutting forceps (bone), Gigli saw.

(3) *Hunter's Operation.*—Expose and tie the main artery some distance above the sac in sound tissue (Fig. 256).

(4) *Brasdor's Operation.*—Expose and ligate upon the distal side of the sac (Fig. 257).

(5) *Wardrop's Operation.*—Distal ligation of branch of vessel trunk below the sac (Fig. 258). (*d*) *Manipulation.*

(*e*) *Galvanopuncture.* (*f*) *Injection* (gelatin, perchlorid of iron). (*g*) *Acupuncture* with introduction of fine wire,

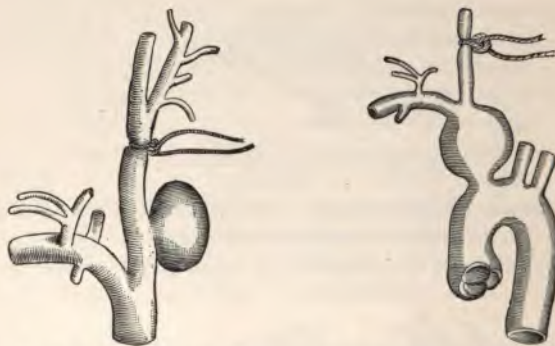


FIG. 257.—Brasdor's operation (Holmes). FIG. 258.—Wardrop's operation (Holmes).

watch-spring, pins, horsehair, catgut, silk (Macewen's method: Irritation of sac-wall lining by scratching with a needle). (*h*) *Strangulation.* (*i*) *Caustic.* (*j*) *Amputation* (rupture, frequent hemorrhages, joint involved, caries, gangrene). Formation of a new artery from the sac by suturing after laying open the aneurysm and turning out the clot is proposed by Matas in selected cases (popliteal aneurysm).

**Prognosis.**—Guarded. Natural terminations: (*a*) Spontaneous cure (rare); (*b*) death by rupture of the sac (externally into a mucous canal, serous cavities); from pressure (esophagus, thoracic duct (inanition); trachea, phrenic,

pneumogastric nerves (asphyxia); bones (vertebræ, neuralgia, meningitis).

Surgical treatment may be followed by death from secondary hemorrhage, pyemia, septicemia, embolism, gangrene.

**Special Aneurysm of**—(1) *Thoracic aorta*: Medical treatment; may tie subclavian, left common carotid; injection. (2) *Innominate*: Medical treatment; distal ligation (carotid, subclavian, or axillary). (3) *Carotid*: Compression: digital pressure, distal ligation (Brasdor's or Wardrop's method), proximal ligation, and amputation. (4) *Axillary*: Compression (digital, instrumental), digital ligation (Brasdor's method). (5) *Brachial*: Compression, ligation (Hunter's, Antyllus' method). (6) *Iliac*: Compression, ligation. (7) *Femoral*: Compression, ligation (Hunter's method). (8) *Popliteal*: Compression (elastic, flexion, instrumental); ligation (Hunter's method).

#### ARTERIAL VARIX.

**Definition.**—Simultaneous elongation and dilatation of an artery.

#### CIRSOID ANEURYSM.

**Definition.**—Simultaneous dilatation and elongation of a number of arteries. (a) *Racemose aneurysm*, parallel arteries affected; (b) *aneurysm by anastomosis*, anastomosed arteries affected.

**Etiology.**—Injury to vasomotor nerves.

**Symptoms.**—Irregular (tortuous), compressible (doughy) tumor of bluish hue, having a superficial cooing bruit; local elevation of temperature.

**Seats.**—Face, scalp, tongue, extremities, internal organs, bones.

**Implements.**—Scissors, scalpel, dissecting forceps, hemostats (12), aneurysm needle, needles, retractors, grooved director.

**Treatment.**—Compression; ligation; excision; injection; galvanocautery.

**Prognosis.**—Guarded in arterial varix. Guardedly unfavorable in cirsoid aneurysm.



## ARTERIOVENOUS ANEURYSM.

1. Aneurysmal varix; direct communication between an artery and a vein (Fig. 259).

2. Varicose aneurysm; indirect communication between an artery and a vein through a sac (Fig. 260).

**Etiology.**—Traumatism (venesection wound, stab, gunshot).

**Pathology.**—Inflammatory agglutination takes place between the artery and vein. In aneurysmal varix the arterial blood-stream is projected against the venous current, giving rise to a pathognomonic rasping sound (*susurrus*). In varicose aneurysm the agglutination is followed by ex-

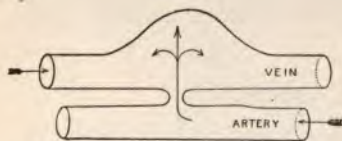


FIG. 259.—Plan of an aneurysmal varix.



FIG. 260.—Varicose aneurysm (Spence).

travasation of blood between the walls of the vessels, with separation and inflammatory lymph-sac formation.

**Symptoms.**—(a) Aneurysmal varix; small compressible tumor; *susurrus*. (b) Varicose aneurysm: sac-formation sometimes felt; soft bruit.

**Implements.**—Esmarch bandage, scalpel, scissors, dissecting forceps, hemostats (8), retractors, needle, needles.

**Treatment.**—(a) Aneurysmal varix: Elastic bandage, compression, ligation, excision. (b) Varicose aneurysm: Ligation, excision.

**Prognosis.**—Guarded.

## VENESECTION.

(Phlebotomy.)

**Definition.**—Withdrawal of blood by division of a vein (Figs. 261, 262). Median cephalic (away from the line of the artery), at the bend of the elbow, usually selected.

**Required For.**—Apoplexy (with a strong pulse); early stage of pneumonia (abortive treatment in the robust) in which the heart is engorged, cyanosis (slate color and dyspnea); aneurysm; beginning inflammations.

**Implements.**—Scalpel, dissecting forceps, scissors, hemostats (2), curved needle, curved bistoury.

**Method.**—Prepare the skin surface as for aseptic operation; make prominent the veins of the forearm by compression about the middle of the forearm, patient with



FIG. 261.—Incisions for venesection (Bernard and Huette).



FIG. 262.—Superficial veins in front of elbow (Bernard and Huette).

clenched fist. Dissect the vein, pass two ligatures, securing the upper one; puncture or incise vein; withdraw sufficient blood (determine by state of pulse); tighten lower ligature; close the wound. Venesection may be more readily accomplished by passing a curved bistoury beneath the vein, made prominent by bandage compression at the middle of the forearm, and cutting outward. Apply compress and bandage when sufficient blood has been withdrawn.

#### PHLEBITIS.

**Definition.**—Inflammation of a vein.

**Morphology.**—(a) Acute primary (diffuse), follows traumatism or local infection. (b) Subacute secondary (circumscribed) follows chronic disease (thickening of the coats with occlusion).

**Symptoms.**—Pain, tenderness, hard, cord-like, with

prominences (knobby) at the sites of the valves, dusky-red line, edema, fever.

**Treatment.**—Rest, elevation, cold, hot fomentations.

**Prognosis.**—Favorable.

## VARIX; VARICOSE VEIN.

(Phlebectasis.)

**Definition.**—A morbid dilatation and tortuous elongation of a vein, associated with thickening of the walls.

Veins of lower extremity (internal saphenous), scrotum (varicocele), rectum (venous piles) most often affected (Fig. 263).

**Etiology.**—Predisposing Causes.—

(a) Female sex; (b) middle age; (c) occupation (much standing); (d) tight clothing (garters); (e) posture (Japanese edema).

**Active Causes.**—(a) Pregnancy; (b) tumor; (c) organic heart or lung disease.

**Pathology.**—Dilatation, elongation, thickening of the walls (outer coat principally, periphlebitis), shrinking of the valves. Rarely the adventitia becomes thinned. When varicosity begins in the capillaries the condition presents an arborescent (cart-wheel) appearance. Edema, eczema, ulceration (varicose ulcer), with



FIG. 263.—Varicose veins of leg.

rupture of the vein, may occur. Thrombosis with calcification (vein-stones—phleboliths) may take place; true osseous change (bone-formation) has been noted.

**Symptoms.**—Characteristic appearance, with pain, tenderness along the course of the vessel.

**Implements.**—Scissors, scalpels, dissecting forceps, retractors, aneurysm needle, needles, Esmarch bandage.

**Treatment.**—Rest, compression (elastic bandage), ligation, dissection, excision. Encircling the leg by a single in-



cision extending through the varicosities has been suggested (permanent edema below the incision has resulted from this method).

**Prognosis.**—Favorable if single, otherwise guarded.

### NEVUS.

**Definition.**—A disease of the veins or capillaries characterized by simultaneous elongation and dilatation (Fig. 264).

**Morphology.**—(1) Capillary varix, mother's mark (telangiectasis): (a) Strawberry-like tumor (large capillary vessels); (b) port-wine mark (small capillaries). (2) Venous, occurs as tumor or elevation of reddish-purple hue; is compressible (doughy).

**Complications and Sequelæ.**—(a) Hemorrhage; (b) malignant degeneration.

**Implements.**—Needles, scissors, scalpel, hemostats (6), dissecting forceps.

**Treatment.**—Injection (hot water at 180°–200° F.—82.2°–94.2° C.); perchlorid of iron, alcohol; ligation; suture (purse-string suture extending about the growth; atrophy occurs from a cutting-off of the blood-supply); excision; cautery; galvanopuncture; freezing.

**Prognosis.**—Guarded (depending upon size of growth).



FIG. 264.—Nevus.

## HEART AND PERICARDIUM.

### EFFUSION INTO PERICARDIAL SAC.

May be (a) serum; (b) blood; (c) pus.

**Etiology.**—Dyspnea, dysphagia, cyanosis, precordial oppression, dilatation of superficial veins. Symptoms of pericarditis; hectic, if purulent.

**Treatment.**—When life is threatened and internal medicine fails, aspiration (tapping, paracentesis pericardii) through

the fifth interspace, a little to the right of the apex-beat. Withdraw the fluid slowly; incision; drainage.

**Prognosis.**—Guarded.

#### OVERDISTENSION OF THE HEART, DUE TO ACUTE OBSTRUCTION OF PULMONARY CIRCULATION.

**Treatment.**—When medication and milder measures fail, tapping (paracentesis auriculi) carried out by rapid puncture through the third intercostal space at the right border of the sternum.

**Prognosis.**—Guarded; only to be employed as a last resort.

#### WOUNDS OF THE HEART AND PERICARDIUM.

Result from stabs and gunshot wounds.

**Symptoms.**—Shock, pain, hemorrhage (area of dulness increased), with a history of injury.

**Treatment.**—Rest, position, opium (for pain and to quiet circulation); suturing has been successfully performed.

**Prognosis.**—Always guarded.

#### MEDIASTINUM.

##### NEW GROWTHS.

May be: Sarcoma, carcinoma, tuberculous.

**Symptoms.**—Early are obscure; later, pressure-symptoms arise, rapid wasting.

**Treatment.**—Palliative.

**Prognosis.**—Unfavorable.

##### WOUNDS.

May be: Stab, compression, fracture (sternum).

**Complications.**—Hemorrhage, abscess (danger from pressure upon heart and lungs).

**Symptoms.**—Early obscure; later, pressure.

**Treatment.**—Control the hemorrhage; aspiration if fluid pus forms.

**Prognosis.**—Guarded.

## CHAPTER XIX.

### SURGERY OF THE RESPIRATORY ORGANS.

#### EPISTAXIS.

(Hemorrhage from the Nostrils.)

**Definition.**—Nose-bleed.

**Etiology.**—(1) Traumatism (falls, blows); (2) spontaneous (local inflammation, irritating vapors, violent exercise, foreign bodies, tumors, parasites); (3) obstruction to the circulation (chronic heart, lung, kidney, liver disease); (4) blood dyscrasia (scurvy, infectious fevers, hemophilia, purpura); (5) onset of fever (typhoid); (6) vicarious (menstruation, suppression of urine, perspiration, hemorrhoidal flux); (7) rarefied atmosphere (high altitudes).

**Symptoms.**—Bleeding from one or both nostrils, with or without leakage into the pharynx.

**Pathology.**—Due to—(a) General vascularity of the nasal mucous membrane; (b) rupture of the inferior artery of the septum; (c) cavernous venous tissue.

**Location.**—Most frequent on the middle cartilage (septum), just within the nares.

**Treatment.**—Rest; position (head raised, arms elevated); loosen clothing about the neck; direct pressure; nasal douche (ice-water, hot water); ice to back of neck; thyroid extract, suprarenal extract, acetanilid, silver nitrate, 60 per cent. chromic acid to ulcerated surfaces; cotton plugs; tampons (gauze, cotton) attached to stout thread, passed by aid of a soft-rubber catheter or a Bellocq's cannula. Remove or renew the tampons after forty-eight hours. May pour paraffin into the packed nasal cavity for uncontrollable bleeding.

**Prognosis.**—Usually favorable.



## FOREIGN BODIES.

Usually gain entrance from without, or they are vomited; parasites (insects, worms); calculi (rhinoliths, blood, or mucus as a nucleus).

**Symptoms.**—Sneezing, itching, pain, headache, mouth-breathing, hemorrhage, mucous or purulent discharge (unilateral), edema, convulsions, visual demonstration.

**Treatment.**—Forcible blowing (other nostril closed by pressure of the fingers) of the nose by the patient; forcible blowing by the surgeon through a tube inserted into the other nostril (compressed); forceps; tenaculum; stick having one end moistened with glue (allow it to remain in contact until dry, when withdrawal of the object adhering to the end of the stick may be accomplished); dislodge backward into the pharynx. Primary stage of general anesthesia may be required.

## NASAL DEFORMITIES.

**Alæ.**—(*a*) Contraction; (*b*) occlusion. Due to ulceration; congenital syphilis.

**Fissure.**—Sinus. Due to congenital or chronic nasal diseases.

**Synechia.**—Adhesion of parts within the nasal cavity: (*a*) Congenital (rare); (*b*) secondary to ulceration.

**Treatment.**—Dilatation; incision; nasal splints; dissection and suturing.

**Implements.**—Head-mirror, throat-mirror, specula, probe-pointed knives (long, short), angular scissors, cotton applicator, Politzer bag, saws (long, short), tenaculum, angular forceps, insufflator, atomizer, needles, light.

**Prognosis.**—Favorable.

**Depression (Saddle-back Nose).**—**Etiology.**—Fracture; syphilis; tuberculosis.

**Treatment.**—(1) Injection of sterilized paraffin (110° F., several sittings may be required). (2) Insertion of platinum or cellulose (non-corrosive) molded splint. General anesthesia is required. (3) Retention suture (silk) through base of nose. Brain embolism has followed the paraffin-injection method.

**Prognosis.**—Guarded.

**Protrusion.**—(1) *Angular*; treat by dissection of soft parts from the bridge and removal of excess by cutting forceps. (2) *Pug-nose, tip-tilted*; treat by narrow V-shaped excision from the middle cartilage at the junction with the lip; suture. Employ cocain or general anesthesia.

**Prognosis.**—Guarded.

**Deflection** (Fig. 265).—Septum is straight up to the seventh year of life. Seventy-six per cent. of adults have deflections (left-sided more common).

**Etiology.**—Traumatism common cause; narrow dental arch (congenital).

**Symptoms.**—Obstruction to breathing; contraction of side



Fig. 265.—Varieties of deflection of the nasal septum (Roberts).

of nose affected. Determine the extent of a deflection by visual examination.

**Implements.**—Head-mirror, strong illumination, throat-mirror, speculum, probe-pointed knives (long and short), angular scissors, saws (long, short), snare, angular forceps, cotton applicator, tenaculum, atomizer, pins.

**Treatment.**—Employ general anesthesia for children, cocain in adults ( $\frac{1}{2}$  to 4 per cent.). Make a circular, scooped incision, removing excess of tissue (spurs, exostoses); fracture into shape; retain with pins (Fig. 266). Operative perforations readily heal. Treat hemorrhage by packing.

**Prognosis.**—Favorable.

## NEOPLASMS.

### (New Growths.)

(a) Lipoma; (b) adenoids; (c) carcinoma; (d) sarcoma; (e) exostoses (spurs).

**Polypi ; Adenoids.**—Mucous polypi (Fig. 267), adenoid vegetations, commonest form of nasal growths.

**Etiology.**—Unknown ; heredity has been suggested as a cause.

**Pathology.**—The condition may not be recognized until complete closure of the nasopharynx occurs. The growths are made up of myxomatous or fibromyxomatous tissue ; may be cystic, due to occlusion and distention of the glands with mucoid secretion. May occur at any age. Adenoid vegetations are considered to be inflammatory hyperplasias of the mucous membrane with myxomatous degeneration in the epithelium or hypertrophies of normal tonsillar tissue.



FIG. 266.—Pins inserted for deviation of septum in Roberts's method of operation.

FIG. 267.—*a*, Mucous polypi in the nose ; *b*, anterior view of same, normal size (Sajous).

**Symptoms.**—Headache, mouth-breathing, neuralgia, open mouth, dead voice, broadened nose, edematous tissues, cough, impaired hearing, chorea, vertigo, epilepsy, loss of power of concentration of mind (aproxesia), discharge (mucopurulent). Examination under brilliant illumination ; head-mirror, throat-mirror ; a speculum view gives an appearance like the pulp of a grape ; may be closely packed. By means of a probe discover pedicles and attachments (middle meatus of nose commonest site).

**Implements.**—Mirrors, strong illuminant, specula, snare, angular forceps, angular scissors, cotton applicator, polypus-forceps, atomizer. Potassium bromid, saturated solution to



be employed as a gargle. Is of value when using a throat-mirror in a sensitive throat.

**Treatment.**—*Local.*—Snare, forceps; under cocain or general (primary) anesthesia. Curet the sloughs upon third or fourth day. *General.*—Fresh air, outdoor life.

**Prognosis.**—Good if entirely removed.

### ABSCESS.

**Morphology.**—Septum common site: (*a*) Acute; traumatism (hematoma); infection (furuncle); (*b*) chronic (tuberculosis, syphilis).

**Symptoms.**—Pain, tenderness, swelling.

**Treatment.**—Early; free incision, drainage. Constitutional.

**Prognosis.**—Favorable.

### ACUTE RHINITIS.

(Coryza; Cold in the Head.)

**Definition.**—Acute inflammation of the mucous lining of the nasal cavities.

**Etiology.**—Exposure when body is overheated, dust, irritating vapors, infectious diseases.

**Pathology.**—Inflammation of mucous membrane. Secretion absent in first stage, followed by irritating, watery, mucoid discharge which finally becomes mucopurulent.

**Symptoms.**—Malaise, headache, aching in the back and legs; fulness felt in the nostrils, sneezing, feverishness; irritating discharge begins after twenty-four hours. Herpes upon the lips. After forty-eight hours discharge becomes thick and purulent while the general symptoms gradually subside.

**Complications.**—Extension of the inflammation to conjunctiva, pharynx, larynx, Eustachian tube; a slight deafness.

**Treatment.**—**Abortive.**—(*a*) Tablespoonful—f3iv (16 c.c.)—of paregoric given during the first twelve hours.

(b) R. Cinchonidæ sulph. . . . . ʒss (2 gm.).  
 Ext. nucis vomicæ . . . . . gr. iij (0.199 gm.).  
 M. Pil. No. xxx.  
 Sig.—One pill every two hours.

In addition :

R. Morph. sulph. . . . . gr. ss (0.033 gm.).  
 Pulv. acaciæ . . . . . ʒj (4 gm.).  
 Bismuth. subnitrat. . . . . ʒiij (12 gm.).  
 M. Sig.—Use as a snuff every half-hour.

Remain indoors. Next day may go out, but keep up the treatment.

When severe: Dover's powder, gr. v (0.333 gm.), given in combination with quinin, gr. ij (0.133 gm.), three or four times a day.

R. Menthol . . . . . gr. ij-iij (0.133-0.199 gm.).  
 Liquid cosmolin (albolin) . . . . ʒj (32 c.c.).  
 M. Sig.—Apply locally (snuffing up the nose).

**Prognosis.**—Good ; the disease is self-limited.

## CHRONIC RHINITIS.

(Catarrh of the Nose.)

**Definition.**—Chronic inflammation of the nasal mucous membrane in which there is increased discharge and impairment of function.

**Morphology.**—(1) Chronic hypertrophic rhinitis ; (2) chronic atrophic rhinitis.

## CHRONIC HYPERTROPHIC RHINITIS.

**Etiology.**—Nasal obstruction, long series of uncured acute coryzas, impure air (weavers, stone-cutters).

**Pathology.**—Septum, floor, lower and middle turbinates affected.

**Symptoms.**—Mucous discharge ; liability to frequent attacks of acute rhinitis ; nasal obstruction ; headache ; impaired hearing, smell.

**Implements.**—Cotton applicator, atomizer, insufflator,

head-mirror, throat-mirror, specula, saw, snare, knife, angular forceps, angular scissors.

**Treatment.**—Remove obstructions (exostoses); correct deflections; control secretion by:

R. Ammon. muriat.,  
Camphor,  
Quin. sulph. . . . . aa gr. ss (0.033 gm.).  
Pulv. opii,  
Ext. belladon.,  
Ext. aconit. . . . . aa gr.  $\frac{1}{16}$  (0.006 gm.).

M. Ft. No. xviii.

Sig.—One tablet every hour until dryness of throat occurs, then increase the interval to three or four hours.

#### Stimulating applications:

(1) R. Menthol . . . . . gr. xx (1.333 gm.).  
Cocain muriat. . . . . gr. xvj (1.066 gm.).  
Vaselin alb. . . . . q. s.  $\frac{3}{4}$ ss (16 gm.).

M. Sig.—Apply with applicator.

(2) R. Witch hazel (dest. ext.) . . . . 1 part to 3 or 4 parts of water  
Sig.—Spray.

(3) R. Witch hazel (dest. ext.) . . . . . f $\frac{3}{4}$ j (4 c.c.).  
Alcohol . . . . . f $\frac{3}{4}$ j (4 c.c.).  
Water . . . . . f $\frac{3}{4}$ ij (64 c.c.).

M. Sig.—Spray.

(4) R. Menthol . . . . . 6 per cent.  
Stearate of zinc . . . . . q. s.

M. Sig.—Insufflate.

(5 a) R. Iodin . . . . . gr. viij (0.532 gm.).  
Potass. iodid. . . . . gr. xxiv (1.599 gm.).  
Glycerin . . . . . f $\frac{3}{4}$ ss (16 c.c.).—M.

(b) R. Iodin . . . . . gr. xij (0.799 gm.).  
Potassii iodid. . . . . gr. xxxvj (2.399 gm.).  
Glycerin . . . . . f $\frac{3}{4}$ ss (16 c.c.).—M.

(c) R. Iodin . . . . . gr. xvj (1.066 gm.).  
Potassii iodid. . . . . gr. xlviij (3.199 gm.).  
Glycerin . . . . . f $\frac{3}{4}$ ss (16 c.c.).

Sig.—Spray.

Reduce hypertrophies with chromic acid. General tonic and hygienic measures.

**Prognosis.**—Favorable if persistently treated.



## CHRONIC ATROPHIC RHINITIS.

(Dry Catarrh.)

A disease of early life; more frequent in females.

**Etiology.**—Consecutive to a long-standing rhinitis; constitutional defect (lowered vitality).

**Pathology.**—Increased roominess of nasal chambers (atrophy); glazed mucous membrane; decrease of secretion with drying (crusting); decomposition (ozena).

**Symptoms.**—Fetid breath (decomposing crusts, ozena); loss of smell; secondary changes in pharynx, larynx; general health affected (inhaling poisonous air).

**Diagnosis** from syphilis by absence of ulceration or denuded bone.

**Treatment.**—(1) Secure perfect cleanliness of nasal cavities; hot water; Dobell's solution:

R Sodii bicarb.,  
Sodii bborat. . . . . aa gr. xx (1.333 gm.).  
Acid. carbolic. . . . . gtt. vj (0.399 c.c.).  
Glycerin . . . . . fʒ vj (24 c.c.).  
Aque . . . . . q. s. ad fʒvj (192 c.c.).

M. Sig.—Local; spray.

(2) Stimulate mucous membrane with iodine solutions.

(3) *General Treatment.*—Tonics; daily nasal cleanliness through life (Dobell's solution; witch-hazel).

**Prognosis.**—Good within certain limits. By persistent treatment you can stop crusting and odor (ozena).

## FIBRINOUS RHINITIS.

An infectious disease, rare in adults, frequent in children. Due to coccic infection; some cases are really diphtheria (nasal). Upon examination both sides of turbinates are found covered with a thin, adherent membrane.

**Implements.**—Forceps, angular scissors, cotton applicator, mirrors, specula, atomizer.

**Treatment.**—Remove membrane; antiseptic sprays.

**Prognosis.**—Protracted treatment required.

## PERFORATION.

(Perforating Ulcer.)

**Etiology.**—(a) Triangular cartilage; congenital; ulceration from scratching off crusts; operative; infectious fevers; tuberculosis; syphilis; phosphorus-poisoning. (b) Bony septum; congenital defect; syphilis.

**Symptoms.**—Whistling respiration.

**Treatment.**—Cleanliness; silver nitrate gr. lx (4 gm.) to 1 ounce (32 c.c.) of water; constitutional in syphilis, tuberculosis.

**Prognosis.**—Favorable for simple, guarded for syphilitic and tuberculous.

## RHINOPLASTY.

**Definition.**—An operation designed to repair or restore the nose. Required for—(a) Repair of injuries; (b) congenital defects; (c) after disease destruction.

**Implements.**—Hemostats (8), dissecting forceps, tenaculum, needles, scalpel, periosteal elevator, osteotome, mallet.

**Method.**—(1) **Partial Restoration.**—Perform transplantation by dissection of flap from cheek, upper part of nose, or lip. Avoid constriction. After ten days or two weeks divide the pedicle and trim flap; skin-graft flap-wound area.



FIG. 268.—Warren's apparatus for resorting to Tagliacozzi's method.

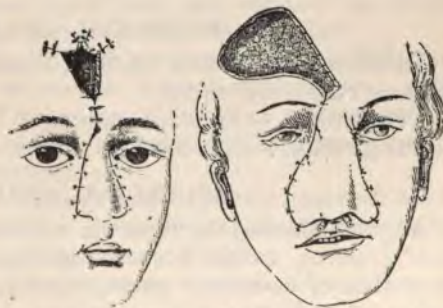


FIG. 269.—Indian method of rhinoplasty (Prince).

(2) **Complete Restoration.**—Form a pattern from paper or oiled silk. (a) *Tagliacotian Method* (Fig. 268).—Dissect a flap

of skin and subcutaneous tissue one-third larger than the pattern (to allow for shrinkage) from patient's right arm. Transplant, holding the patient's arm in position by adhesive straps and bandaging; plaster-bandage dressing (forearm across top of head) for ten to fourteen days; resect the flap, suturing remaining portion in position. Skin-graft denuded arm area. (*b*) *Indian Method* (Fig. 269).—Dissect a flap from forehead, allowing one-third for shrinkage; freshen the edges of the nasal cavity; suture. Periosteum or bone may be carried in the flap for support. Keep the nostrils open by insertion of rubber tubes. Skin-graft forehead wound.

**Prognosis.**—Guarded.

**Artificial noses** (celluloid, papier-mâché) may be employed instead of resorting to operative procedures.

#### FRONTAL SINUS.

Distention may follow fracture, extension of nasal inflammation, foreign body, abscess (empyema), tumor.

**Implements.**—Scalpel, hemostats (6), dissecting forceps, scissors, retractors (small sharp pointed), probe, trephine, needles.

**Treatment.**—Trephine anterior wall; drain.

**Prognosis.**—Guardedly favorable.

#### ETHMOIDAL CELLS.

Distention may follow fracture, extension of nasal inflammation, caries, diphtheria.

**Treatment.**—Trephine, drainage.

**Prognosis.**—Guarded.

#### SPHENOIDAL SINUS.

May be affected by fracture, extension of inflammation, new growths, caries, necrosis, giving rise to hemorrhage, thrombus of cavernous sinus, nerve and eye lesions, retropharyngeal abscess.

**Treatment.**—The sinus may be reached through—(*a*) nasopharynx; (*b*) orbit, after removal of the eye; (*c*) nose. Trephine, drainage.

**Prognosis.**—Guarded.



# ANTRUM, ANTRUM OF HIGHMORE, MAXILLARY SINUS.

**Abscess.—Etiology.**—Extension of inflammation (roots of teeth, nose), traumatism (hemorrhage after fracture, epistaxis).

**Symptoms.**—Local pain, swelling; pus drainage into the nose when head is held in certain positions.

**Implements.**—Scalpel, dissecting forceps, hemostats (4), extracting forceps, grooved director.

**Treatment.**—Drainage: (*a*) Free incision and penetration within the mouth; (*b*) removal of decayed teeth and penetration through the alveolar process; (*c*) counteropening into nasal cavity (for irritation).

**Prognosis.**—Favorable.

## LARYNX.

**Defects, fissure, fistula** (manifested by discharge or escaping air-bubbles), congenital absence of one or more parts.

**Treatment.**—Close fissures and fistulous tracts by plastic work or stimulation with caustic.

**Laryngitis.—Definition.**—Inflammation of the larynx.

**Morphology.**—(1) *Acute*: Catarrhal, croupous, diphtheritic, erysipelatous. (2) *Chronic*: Catarrhal (ulcerative), tuberculous, rheumatic, gouty, syphilitic.

**Etiology.**—Exposure (cold and wet, impure air, vapor, dust), improper use of the voice, specific infection.

**Pathology.**—*Acute*: Mucous membrane red, swollen, covered with mucus; membrane formation (croupous diphtheria). *Chronic*: Thickening of mucous membrane; increased secretion: mucous patches (syphilis); small irregular, grayish ulcers (tuberculosis).

**Symptoms.**—*Acute*: Hoarseness, aphonia (loss of voice), cough, pain (increased by speaking, swallowing, coughing), fever. *Chronic*: Pain, hoarseness, cough.

**Complications.**—Edema, abscess, necrosis, contraction.

**Treatment.**—Acute catarrh: Rest, moist atmosphere (steamed), spray (Dobell's solution, witch-hazel), ice-bag. Internally, laxative, Dover's powder, and quinin, as for coryza; tablets, as for acute coryza; specific treatment—antitoxin for diphtheria.

**Prognosis.**—Favorable.

**Edema.**—Infiltration of products of inflammation in the submucous tissues in and about the larynx.

**Etiology.**—Inflammation, traumatism (wounds, blows), infectious fevers, Bright's disease.

**Symptoms.**—Dyspnea, suffocation.

**Treatment.**—Inhalation of steam, multiple punctures with a curved bistoury, guarded by wrapping with cotton or adhesive strap nearly to the point, intubation, tracheotomy.

**Prognosis.**—Favorable in acute cases after operation.

**Ulceration.**—**Etiology.**—Traumatism, abscess, specific (syphilis, tuberculosis).

**Implements.**—Mirror, tongue-depressor, probe, atomizer.

**Treatment.**—Application of silver nitrate; sprays; constitutional.

**Stricture; Stenosis.**—**Etiology.**—(a) Compression from



FIG. 270.—Polyp of larynx (Stoerck).

without; abscess; tumor; aneurysm; (b) occlusion; congenital; foreign body; tumor.

**Dislocation of Laryngeal Cartilages.**—**Symptoms.**—Dyspnea. **Treatment.**—Tracheotomy and dilatation. **Prognosis.**—Favorable for the immediate effect after operation.

**Tumors** (Fig. 270).—May be benign or malignant.

**Symptoms.**—Hoarseness, diphtheria (double voice), dyspnea, pain, swelling, secretion, cough.

**Treatment.**—Local applications: Silver nitrate, chromic acid, electric cautery; tracheotomy; partial or complete excision of the larynx. **Prognosis.**—Guarded.

**Perichondritis and Chondritis.**—**Definition.**—Inflammation in or about the cartilages of the larynx.

**Etiology.**—Syphilis, tuberculosis, cancer, typhoid fever, exanthemata, traumatism, chronic laryngitis.

**Pathology.**—Inflammation, suppuration, caries, with discharge through a fistula or abscess formation; healing followed by stenosis.

**Symptoms.**—Pain, cough, increased secretion, dyspnea. Determine by external and internal examination.

**Treatment.**—Ice, cold, tincture of iodine, hot fomentations, antiseptic sprays, incision, tracheotomy, laryngotomy; treat ulcers (silver nitrate). Constitutional: Tonic, supportive.

**Prognosis.**—Guarded.

## TRACHEA.

**Foreign Bodies in Trachea or Larynx.**—**Symptoms.**—Violent coughing with dyspnea.

**Treatment.**—Invert the patient, slapping the back; repeated local examinations (mirror) with attempts at removal by fingers or forceps; tracheotomy.

**Prognosis.**—Guarded until recovered.

**Tracheal Hernia (Tracheocele).**—Formed by the protrusion of tracheal mucous membrane through a penetrating wound or congenital cleft.

**Symptoms.**—Compressible tumor formation upon forcible respiratory effort with mouth and nose closed.

**Treatment.**—Compression (compress held on by adhesive strap and bandage); dissection with closure.

**Prognosis.**—Favorable.

**Intubation of the Larynx.**—**Definition.**—Insertion of a tube into the larynx to provide for the functional activity of the lungs.

**Required For.**—(a) Edema of the larynx; (b) laryngeal obstruction (diphtheria, new growths, traumatism).

**Implements.**—Catheter, intubation set (Fig. 271).

**Method.**—Insert tube of suitable size, guarded by silk thread to prevent swallowing tube or passage into trachea. Nourish by rectal feeding; stomach-tube; having head lower



than the body to prevent food entering the trachea. Have air moist (steamed). Catheter may be inserted in emergency. Tube may be removed after two or three days.

**Tracheotomy.**—**Definition.**—Operation of opening the

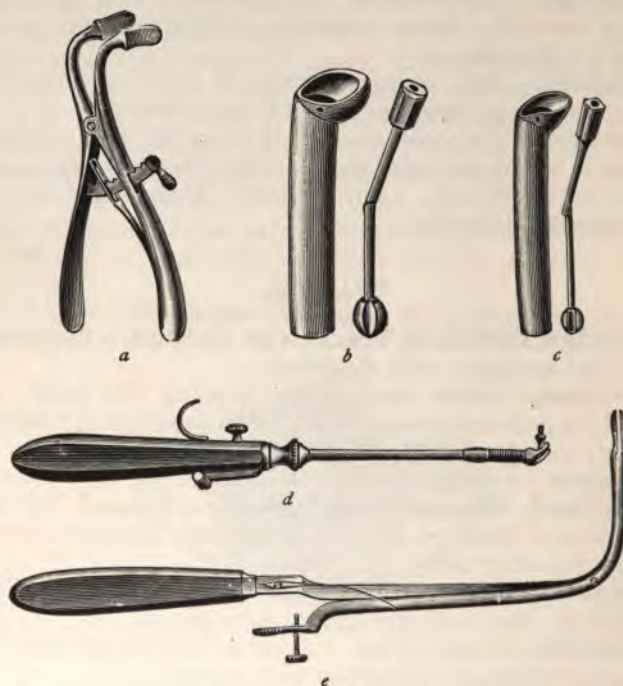


FIG. 271.—O'Dwyer's outfit for intubation: *a*, Mouth-gag; *b*, *c*, tubes with conductors; *d*, intubator; *e*, extubator.

air-passages in the middle line between the larynx and sternum (Fig. 272).

Includes—(*a*) laryngotomy (through cricothyroid membrane or thyroid cartilage); (*b*) thyrotomy (through thyroid cartilage); (*c*) cricothyrotomy (through cricoid and thyroid cartilages); (*d*) laryngotracheotomy (through cricoid and upper rings of trachea); (*e*) tracheotomy (bronchotomy)

(through the trachea, high, above isthmus of thyroid gland; low, below isthmus of gland).

**Required For.**—Edema, obstructed respiration (diphtheria, traumatism, foreign bodies, new growths, aneurysm).

**Implements.**—Scalpel, dissecting forceps, scissors, hemostats (4), retractors (small, sharp-pointed), tenaculum, needles, tracheal tube. Dispense with anesthesia in young children and when haste demands it. Employ general or local anesthesia unless the patient is unconscious.

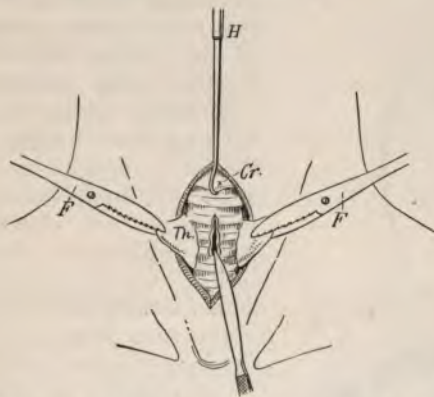


FIG. 272.—Tracheotomy. The trachea is exposed by the division of the isthmus of the thyroid body (*Th*), each side of which is held by a forceps (*F*). *Cr*, the cricoid cartilage, is fixed and drawn upward by a hook (*H*).

**Method.**—Patient's head to be thrown back (chin in line with sternal notch), lowered (prevent entrance of blood into trachea); median incision through skin (transverse in laryngotomy); steady trachea by—(a) thumb and fingers grasping trachea and compressing neck tissues until pulsations of both carotids are felt; (b) by passing two ligatures after the skin incision is made (longitudinally by means of curved needles and including two tracheal rings); (c) tenaculum; retract the superficial veins; incise the cervical fascia (two layers in high operation, three layers in low); retract the sternohyoid and sternothyroid muscles; retract or incise after ligation of the thyroid isthmus; retract the pre-

tracheal venous plexus, thyroidea ima artery, and inferior thyroid vein (when present), thymus gland (infancy); reach trachea; secure by tenaculum, sutures, forceps; incise; clean wound; insert the tube (a bent hairpin has been successfully used in emergency). Supply moist air by steaming.

**Artificial Respiration.**—**Definition.**—Imitation of the respiratory movement.

**Required For.**—Asphyxia (absence of breathing) from drowning, overdose in anesthesia, poisonous gases, spasm or edema of the larynx, false membrane, foreign bodies, morbid growth.

**Method.**—Clear the mouth and fauces; draw tongue forward; loosen or remove clothing. Restore the body-temperature (remove the wet clothes, wrap in heated blankets, apply friction, heat). (a) Mouth-to-mouth (infants; emergency. May fail, owing to air passing into esophagus). (b) Bellows and tube (Fig. 273). (c) Inhalations of oxygen. (d) Sylvester's: Patient on his back upon a firm, flat surface; head lowered (Figs. 69, 70); grasp patient's arms at elbows; extend arms forcibly beyond his head; pause two seconds; flex and



FIG. 273.—Bellows and tube apparatus for securing forced respiration in cases of collapse of the lung during operations about the chest.

compress patient's arms upon his chest; pause two seconds. Repeat movements fifteen times a minute until respiration is restored or until case is proved hopeless. (e) Schultze's (new-born): Wrap the child in a towel; suspend the child between operator's knees by grasping its shoulders (face forward); swing the child and secure flexion of its body upon its shoulders; return swing; repeat fifteen to twenty times; immerse in warm water (to retain body-heat); repeat swinging.

**Laryngectomy.**—**Definition.**—Resection of the larynx.



**Required For.**—Malignant growth (carcinoma), tuberculosis, stricture.

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (10), tenaculum, retractors (small, sharp-pointed), needles, aneurysm needle, tracheal tube.

**Method.**—General anesthesia; head extended and lowered (body in Trendelenberg position); median incision; preliminary tracheotomy (ten days before excision, if possible); expose the larynx; dissect and retract vessels, muscles, fascia, from larynx; ligate and divide isthmus of thyroid gland; separate upper portion of trachea from esophagus; incise trachea and remove larynx (partial or complete) by completing dissection from below or dissect soft parts and remove from above; retention sutures. Prevent bleeding into the trachea by suspending patient. Dressing: gauze packing.

Have air moist (steamed); nourish by rectal feeding, stomach-tube.

#### HEMOPTYSIS.

(Bronchorrhagia; Pulmonary Hemorrhage.)

**Definition.**—Bloody sputum; bleeding from the lungs.

**Etiology.**—Traumatism, inflammation (pneumonia, tuberculosis), malignant disease, chronic heart or liver disease, infectious fevers, ruptured aneurysm, vicarious dyscrasias (purpura, scurvy).

**Symptoms.**—Cough, presence of frothy, bright-red blood in the mouth.

**Treatment.**—Rest; position (elevation of the chest); ice; salt; morphin; ergot; gallic acid; saline purgation; ligation of the extremities.

**Prognosis.**—Guarded.

#### PLEURAL EFFUSION.

**Definition.**—Fluid in the pleural cavities.

May be serum (pleurisy), hydrothorax (dropsy), pus (empyema), chylothorax (chyle from ruptured thoracic duct), blood (hemothorax); with or without presence of air.

**Etiology.**—Inflammation (pleurisy, phthisis, pneumonia, gangrene), new growths, embolism, foreign bodies, traumatism.

**Pathology.**—Serum (inflammatory reaction), pus (inflammatory reaction with infection), blood (traumatism, ruptured aneurysm, erosion of tuberculosis).

**Symptoms.**—Dyspnea, cyanosis, immobility and bulging of interspaces (edematous if purulent), displaced apex-beat, gradually ascending dulness (altered by change of position), increased pulmonary resonance directly above, succussion splash, diminished vocal fremitus, respiratory sounds, vocal resonance, diminished, hectic (if purulent).

**Treatment.**—Aspiration (paracentesis) required when effusion is large, exciting grave dyspnea; purulent; if too slowly absorbed (after third or fourth week); bilateral, and the total amount equals the capacity of one pleural cavity.

**Implements.**—Hypodermic syringe and needle; aspirating needle with vacuum-jar.

**Method.**—Anesthetize a small skin area in seventh interspace, near posterior axillary line; insert needle (guarded by the thumb) with a quick thrust across the upper border of eighth rib; withdraw fluid slowly; seal wound with cotton and collodion. A dry tap may be due to multilocular condition (needle pierces intersepta). *Caution:* Withdraw needle if any sudden symptom of import arises (Fig. 51).

### THORACOTOMY.

**Definition.**—Incision through the chest wall (Fig. 274).

**Required For.**—Abscess, gangrene of the lung.

**Implements.**—Scalpel, scissors, dissecting-forceps, Gigli saw, cutting forceps, needles, hemostats (6), hypodermic syringe.

**Method.**—General or local anesthesia; prepare skin surfaces as for aseptic operation; incision parallel to ribs in an interspace (sixth to eighth) posteriorly, near posterior axillary line; puncture pleura (needle, determine presence and nature of fluid) before incising; enlarge opening; *drain*; irrigation (don't wash out a chest cavity unless the

pus is fetid). Dressing: Gauze; protective; cotton; bandage. To enlarge incision, portion of a rib may be removed by saw or cutting forceps (Fig. 275).

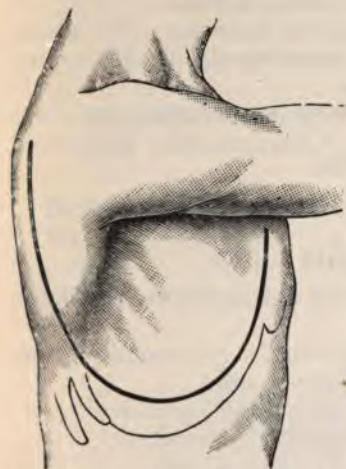


FIG. 274.—Incision for Schede's operation of thoracoplasty (Emsarch and Kowalzig).

**Prognosis.**—Collapsed lung (atelectasis) frequently expands, becoming functionally active.



FIG. 275.—Resection of a rib (Emsarch and Kowalzig).

### NEW GROWTHS.

May be malignant (carcinoma, sarcoma), actinomycosis, bony, cartilaginous, cystic (dermoid, echinococcus, hydatid).

**Diagnosis** by history, exclusion, examination, sputum, aspiration.

**Implements.**—Scalpel, scissors, dissecting forceps, cutting forceps, Gigli saw, hemostats (8), aneurysm needle, needles, probe, grooved director, aspiration needle, retractors (sharp-pointed).

**Treatment.**—Aspiration, resection of ribs, and removal justifiable in selected cases.

**Prognosis.**—Guarded.

### ABSCESS.

May occur—(a) In lung tissue; (b) mediastinum.

**Etiology.**—Inflammation (pneumonia, tuberculosis),



embolism, traumatism, foreign bodies, burrowing pus from cervical adenitis.

**Symptoms.**—Hectic (pus), fever, pain increased by coughing, swallowing, dyspnea, surface edema.

**Implements.**—Scalpel, scissors, hemostats (6), probe, grooved director, trephine, aneurysm needle, needles, aspirating needle, hypodermic syringe.

**Treatment.**—Aspiration; trephine sternum to reach mediastinum; drain; irrigation. Constitutional: Rest, tonic, supportive.

**Prognosis.**—Guarded.

#### HERNIA OF THE LUNG.

Pulmonary hernia (rare) occurs through the costal interspaces or the diaphragm.

**Etiology.**—Congenital malformation; traumatism; emphysema; tuberculosis; whooping-cough.

It may or may not be reducible and is progressive.

**Treatment.**—Compression (strapping the chest).

**Prognosis.**—Guarded.

#### DIAPHRAGM.

**Hernia (Diaphragmatic Hernia).**—**Definition.**—Protrusion of viscera (usually abdominal) through the diaphragm.

**Etiology.**—Traumatism (wound, forcible rupture), congenital malformation.

**Diagnosis.**—Difficult; history; exclusion.

**Treatment.**—Exploratory operation through abdomen.

**Prognosis.**—Guarded.

**Paralysis.**—May follow traumatism (phrenic nerves, fracture or dislocation of vertebra), inflammation (pneumonia, pleurisy), diphtheria, poisoning (lead, arsenic, phosphorus), hysteria.

**Symptoms.**—Sinking respiration.

**Treatment.**—Electricity, counterirritation. Constitutional: Tonic, stimulation.

**Prognosis.**—Guarded.

## CHAPTER XX.

### SURGERY OF THE NERVOUS SYSTEM.

#### NEURITIS.

**Definition.**—Inflammation of a nerve (Fig. 276).

**Morphology.**—May be acute; chronic (ascending or descending); affecting single nerve; multiple (diffuse), affecting several nerve trunks.

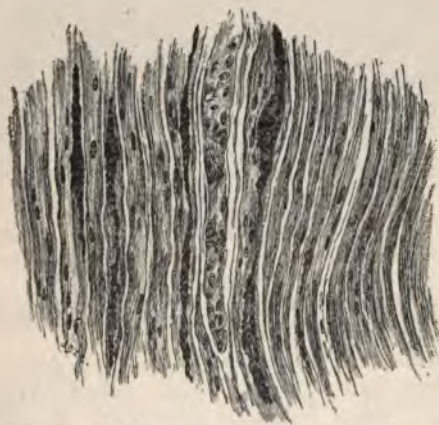


FIG. 276.—Neuritis: Longitudinal section, showing degenerated nerve-fibers (black); Azoulay's method; ( $\times 300$ ) (Stengel).

**Etiology.**—Exposure (cold and wet), traumatism, diathesis (rheumatism, gout, alcoholism, syphilis, tuberculosis), infectious fevers, typhoid.

**Pathology.**—*Acute.*—The nerve is red and swollen; increase of connective-tissue elements; infiltration (leukocytes); degeneration (myelin, axis-cylinder).

*Chronic* (Fig. 277).—Sclerosis (increased connective tis-

sue); the nerve is shrivelled and hard; granular degeneration takes place.

**Symptoms.**—*Acute.*—Remittent aching pain (worse at night), increased by movement; tenderness along the course of the nerve (hyperesthesia, later anesthesia); paresthesia (tingling, numbness, burning); headache; fever; loss of function (muscle twitching); impaired electrocontractility; joint-effusion. Diagnose carefully from joint injury.

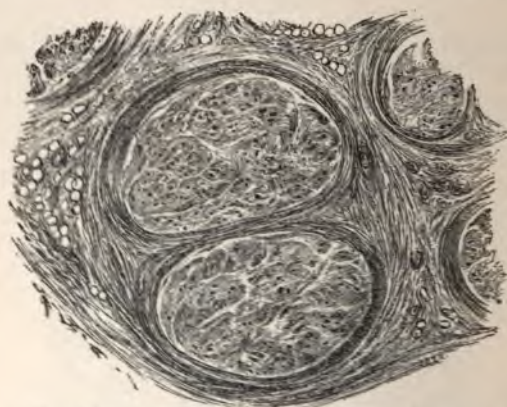


FIG. 277.—Chronic hypertrophic interstitial neuritis ( $\times 200$ ) (case of Dejerine).

*Chronic.*—Pain; anesthesia; paralysis; atrophy; glossy skin and brittle, thickened nails.

**Treatment.**—Absolute rest (splint); lead-water and laudanum; hot fomentations; cold; counterirritation (blisters, cauter); deep injection (morphin, atropin, cocain); electricity. Constitutional: Saline purgation; treat the diathesis.

**Prognosis.**—Guardedly favorable in acute; guarded in chronic.

#### NEURALGIA.

**Definition.**—Paroxysmal pain along the course of a nerve.

**Morphology.**—(a) Of peripheral nerves in general; (b)



of sciatic nerve; (*c*) trifacial (tic douloureux, fifth nerve); (*d*) of scars and stumps; (*e*) of joints.

**Etiology.**—Heredity, traumatism, exposure, nervous exhaustion, diathesis, metallic poisoning (lead, arsenic), reflex irritation (caries of bone or teeth, eye-strain, aneurysm).

**Pathology.**—Unknown; may be a manifestation of neuritis.

**Symptoms and Diagnosis.**—Prodromes: Tingling, chilliness, depression. Attack: Knifelike pain, increased at points of exit from bony canals or fibrous sheaths (Valleix's points; points douloureux); neuralgic pain is most often unilateral. Absence of fever. Local swelling or herpetic eruption may occur.

**Treatment.**—Rest in a quiet, darkened, well-ventilated room; apply hot fomentations, cold, counterirritation (blisters, cautery), injection (morphin, atropin, chloroform, cocain). Internally, morphin, bromids, phenacetin, cannabis indica, chloral. Treat the diathesis.

Between attacks, tonics (iron, quinin, arsenic, strychnin); hyoscyamus, gelsemium, aconite; massage; electricity; counterirritation; operation—incision—release nerve-fibers; nerve-stretching (neurectasy); section (neurotomy); excision of a portion of the nerve (neurectomy).

**Prognosis.**—Good for attack; guarded for cure.

### TUMORS.

**Neuromata.**—**Definition.**—A tumor developed within a nerve.

**Etiology.**—Obscure; traumatism.

**Pathology.**—May be true (fibrillar, ganglionic), growing along the course of a nerve or in a stump; false (fibrous, myxomatous, gliomatous, sarcomatous). May be single or multiple.

**Symptoms.**—Sometimes none are manifested; pain, paralysis, atrophy.

**Implements.**—Scalpel, scissors, dissecting forceps, retractors (dull and sharp-pointed), hemostats (8), aneurysm needle, tenaculum, needles, grooved director.

**Treatment.**—If no symptoms, may be let alone; other-

wise excision general anesthesia is usually required, removal of the growth with approximation of cut ends by suturing (Fig. 278), nerve-stretching, grafting, transplantation nerve, decalcified bone.

**Prognosis.**—Guarded by favorable for benign, unfavorable for malignant growths.

**Painful Subcutaneous Tubercle.**—**Definition.**—A small subcutaneous fibrous tumor connected with a nerve filament.

**Symptoms and Diagnosis.**—Of slow growth; accompanied by great pain and tenderness.

**Treatment.**—Excision under general or local anesthesia.

**Prognosis.**—Favorable.



FIG. 278.—Operation for the prevention and cure of amputation neuroma (Senn).



FIG. 280.—Paralysis of musculospiral nerve after fracture of the humerus ("wrist-drop"), but when fingers have been flexed into palm, they can be extended, i. e. at first interosseous joints by ulnar and median, which are supplied by the ulnar and median nerves (Erichsen).

## INJURIES

Contusions (blows, falls, fracture, dislocation); compression tumors, crutch palsy, aneurysm, childbirth, strained sleeping position. Hemorrhage may occur into nerve substance.

**Symptoms.**—Tingling, numbness, burning pain (causalgia), tenderness, paralysis (Fig. 279), atrophy.

**Treatment.**—Treat the cause; rest (splint), position (elevation), cupping, leeching, electricity. Internally, arsenic, strychnin.

**Prognosis.**—Guardedly favorable.

## WOUNDS.

May be incised or punctured.

**Symptoms.**—(a) Immediate: Shock, pain, loss of function, hemorrhage; (b) later may be complicated by infection, trophic changes.

**Diagnosis.**—1. Division of the **fifth nerve** (trifacial): (a) Ophthalmic branch affects sensation to eye, lacrimal gland, nasal cavities, skin of brows, forehead, nose; (b) superior maxillary branch, sensation to dura mater, orbit, temple, cheek, palate, pharynx, lip, nose, teeth (upper jaw), gum; (c) inferior maxillary branch, sensation to tongue, teeth (lower jaw), gums, temple, external ear, lower part of face, lower lip; motion, muscles of mastication.

2. **Seventh nerve** (facial) affects motion: Muscles of face; eyebrow cannot be raised; eyelids only partially closed; angle of mouth droops; alae of nose cease to move in respiration; flat expression; impaired taste (involvement of chorda tympani). Permanent facial palsy has been overcome by grafting facial to spinal accessory or hypoglossal nerves.

3. **Pneumogastric** (inferior recurrent laryngeal branch) affects sensation of pharynx, esophagus, trachea; motion in larynx hoarseness, altered voice, suffocation, if both branches cut.

4. **Ulnar** affects sensation of little finger, ulnar half of ring-finger; motion; loss of flexion in little and ring-fingers; impaired ulnar flexion and adduction; inability to extend fingers (intercostal muscles); loss of thumb adduction.

5. **Median** affects motion; loss of flexion of second phalanges, flexion and abduction of thumb; loss of pronation; wrist may be flexed if first adducted (flexor carpi ulnaris); sensation—palmar surface first three and one-half fingers, dorsal side lower end of middle finger.

6. **Radial** affects sensation of skin surface, dorsal side of hand, first three and one-half fingers.

7. **Musculospiral** affects sensation of skin surface of back of arm, forearm, hand; motion, loss of extension, forearm, wrist (wrist-drop), and fingers, excepting last phalanges (interossei muscles); loss of supination (unless arm is first flexed when biceps will act).



8. **Great sciatic** affects sensation; lost in lower leg and foot, excepting upper half of posterior and inner sides; motion, total loss below the knee (foot-drop).

Reaction after section (Wallerian degeneration):

AnClC < CaClC	} Muscle normal.
AnOC > CaOC	
AnClC = CaClC	} Muscle in first stage of degeneration.
AnOC = CaOC	
AnClC > CaClC	} Muscle in more advanced stage of degeneration.
AnOC < CaOC	
An = Anode or (+ positive).	
Cl = Closing.	
C = Contraction.	
Ca = Cathode or (- negative).	
O = Opening.	
< = Less than	} Apex points to the lesser quantity.
> = Greater than	
= = Equal to.	

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (8), tenaculum, aneurysm needle, needles (fine), retractors (dull and sharp-pointed), Esmarch bandage.

**Treatment.**—Unite the cut ends of the nerve. Primary operation: Incision and dissection through the wound; freshen and unite ends of nerve by catgut suture; stretching and suturing; nerve-grafting; transplantation. Secondary operation (after healing of the wound): Incision and dissection through the soft parts; freshen ends of divided nerve (removing bulbous formation); lower end, if shrunken, may be traced from below the site of the injury. Employ nerve-suturing, stretching, grafting, and transplantation (bone, section of nerve of animals).

**Dressing.**—Gauze, bandage, splint.

**After-treatment.**—Massage, electricity.

**Prognosis.**—Guardedly favorable. Sensation usually returns before motility.

## OPERATIONS.

**To expose**—1. **Supra-orbital.**—Make a curved incision through the eyebrow, one inch (2.5 cm.) long, extending above the supra-orbital notch or foramen.

2. **Superior Maxillary Branch of the Trifacial (Infra-orbital).**

—(a) Curved incision beneath the orbit opposite the infra-orbital foramen (a line drawn from supra-orbital notch to a point midway between the two lower bicuspid teeth passes through intra-orbital foramen); the nerve is deeply placed beneath the levator labii superioris muscle; (b) through the mouth by elevation of the cheek; (c) elevation of the periosteum from the floor of the orbit, breaking in the roof of infra-orbital canal.

3. **Meckel's Ganglion.**—(a) T-shaped incision or triangular raised from cheek, exposing infra-orbital canal; trephine anterior wall of antrum; cut away the floor of infra-orbital canal and groove; infra-orbital nerve as a guide; trephine posterior wall of antrum (avoid injury to internal maxillary artery); open up sphenomaxillary fossa; draw infra-orbital nerve through trephine opening as a guide to ganglion. Infra-orbital and terminal branches of internal maxillary arteries are divided. (b) Resect the zygoma, reflecting temporal muscle, and so reaching sphenomaxillary fossa. (c) Expose the infra-orbital nerve, elevation of the periosteum of the floor of the orbit; trace the nerve to the ganglion without opening the antrum.

4. **Inferior Dental.**—(a) At mental foramen, guide (continuation of line for infra-orbital foramen); incision through the mucous membrane of the mouth; (b) before entering the dental foramen; the patient's mouth to be gagged widely open; incision extending from the last upper molar to the last lower molar tooth, along the inner side of the coronoid process of the lower jaw; retract with the finger-tip; reach the bony point marking the orifice of the foramen; pick up the nerve with a tenaculum; (c) external incision, curved, beginning at the angle of the jaw, extending along its lower border; retract the skin, fascia, separate the masseter muscle from the bone; trephine  $1\frac{1}{4}$  inches (3.12 cm.) below the angle of the jaw; expose the nerve; (d) same incision; dissect and retract the soft parts; reach the edge of the jaw; scrape the pterygoid muscle from the inner aspect of the bone; reach a bony point at the foramen orifice; expose the nerve.

5. **Gasserian Ganglion.**—(a) *Rose's Method* (Figs. 280, 281).—Temporary suture of the eyelids (protects the eyeball);

raise a flap from the angle of the jaw (avoiding facial nerve, Stenson's duct); expose the zygoma, drill the bone, and retract; divide and remove the coronoid process of the lower jaw; ligate the internal maxillary artery; separate the external pterygoid muscle from the greater wing of the sphenoid; trephine the bone about the foramen ovale. Bleeding is free.

(b) *Hartley-Krause Method* (Fig. 282).—Raise a horseshoe flap extending through the scalp and skull by incision (scalpel, chisel, narrow osteotome), leverage (periosteal elevators), and fracture (narrow base of bony flap) over the temporal region; ligate the middle meningeal artery; the



FIG. 280.—*a*, The Braum-Lossen incision; *c*, Rose's incision for reaching the sphenomaxillary fossa (Rose).

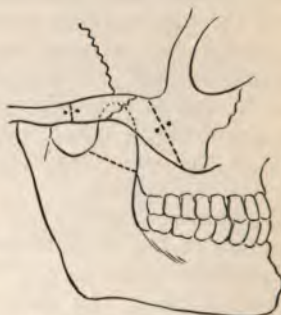


FIG. 281.—Lower jaw and zygoma. Drill-holes and saw-cuts are shown (Rose).

dura is not to be opened; raise the temporosphenoid lobe; expose the superior and inferior maxillary branches of the fifth nerve; expose the ganglion. Hemorrhage is at times profuse; may ligate the common carotid artery if necessary. Entire ganglion cannot be removed without opening cavernous sinus (Horsley). (*c*) Superior and inferior maxillary branches of the fifth nerve may be reached by a curved incision through the origin of the temporal muscle; division of the zygoma at each end; turn down the flap (soft parts and bone); reach the nerves at the foramina.

6. **Facial Nerve (Seventh).**—Guide, a line drawn across the



parotid gland forward and a little downward from the point where the anterior border of the mastoid process meets the ear.

(a) *Baum's Method*.—Slightly curved incision 2 to 3 inches (5-7.5 cm.) long behind the ear; retract the soft

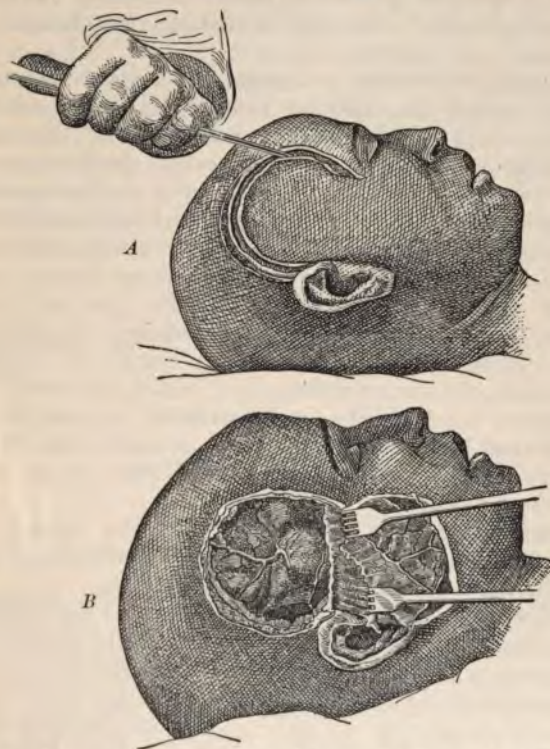


FIG. 282.—Intracranial neurectomy of the fifth nerve: *A*, Manner of holding the chisel in cutting the groove through the bone; *B*, flap lifted and turned down, exposing the dura mater and middle meningeal artery (Hartley).

parts; reach the posterior portion of the parotid gland (guide); reach the sheath of sternocleidomastoid muscle (guide); clear the interspace; reach the prevertebral fascia

at the bottom (guide); expose the nerve in front of the prevertebral fascia.

(*b*) Found at a spot one-quarter of an inch (0.625 cm.) in front of the center of the anterior border of the mastoid process.

(*c*) *Hüter's Method*.—Vertical incision in front of the ear; reach the parotid gland; expose a branch of the nerve; trace to the trunk. May fail to include branches to occipital frontalis and orbicularis muscles.

7. **Lingual**.—(*a*) Pass a retraction suture through the tongue; expose the affected side by making tension; feel the nerve as a tense cord in the floor of the mouth; expose by an incision extending through the mucous membrane; (*b*) may be reached through the mucous membrane beneath the first molar tooth in contact with lower jaw.

8. **Spinal Accessory**.—(*a*) To expose before entering the sternocleidomastoid muscle; incision along anterior border of that muscle, beginning just below the ear; retract anterior border of sternomastoid muscle; (*b*) below the muscle; incision along the posterior border of the middle of the sternocleidomastoid muscle; retract soft parts; reach the posterior border of the muscle; retract; expose the nerve.

9. **Cervical Plexus**.—Expose by an incision and retraction along the middle of the posterior border of the sternocleidomastoid muscle.

10. **Brachial Plexus**.—Expose above the clavicle by a longitudinal incision as for ligation of subclavian artery; reach the plexus directly beneath deep fascia.

11. **Median**.—(*a*) In the arm: incision as for ligation of the brachial artery, along inner border of the middle of the biceps muscle; (*b*) in forearm above the wrist-joint: incision along inner side of the tendon of the palmaris longus muscle; retract and expose the nerve lying beneath the deep fascia.

12. **Ulnar**.—(*a*) Middle of the arm: incision a little posterior to the incision for the median nerve; reach the nerve lying beneath the deep fascia; (*b*) at the elbow: expose by an incision extending from the internal condyle to the olecranon; the nerve lies beneath the deep fascia; (*c*) above the wrist-joint: incision along the radial side of the tendon of the flexor carpi ulnaris muscle.

13. **Musculospiral.**—An incision corresponding to the musculospiral groove between the biceps and supinator longus muscles; feel the nerve lying in an interspace beneath the deep fascia.

14. **Radial.**—Above wrist: longitudinal incision outer side of forearm; reach the nerve passing to the back of the hand; expose it lying beneath the tendon of the supinator longus muscle.

15. **Great Sciatic.**—Longitudinal incision in the middle line of the posterior aspect of the thigh, extending from the gluteofemoral crease; reach the deep fascia; incise; expose the biceps muscle; retract; expose the nerve lying upon the outer side.

16. **Tibials.**—(a) Incision as for arteries; (b) behind the internal malleolus the nerve lies back of the artery.

#### NERVE SUTURE.

**Required.**—After traumatic division; excision (Figs. 283, 284).

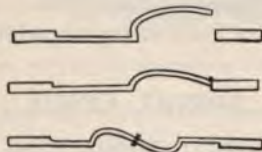


FIG. 283.—Suture of a nerve by splitting the ends (Beach).

**Method.**—General anesthesia; apply an Esmarch bandage above the seat of the injury; expose the nerve by dissection through the wound; freshen the cut edges; stretch the nerves to approximate; retain by two or more sutures (fine silk, catgut) placed lengthwise through the sheaths and nerve substance. Secure absolute rest; splints.

#### NERVE STRETCHING.

(Neurectasy.)

Has been done to secure approximation after rupture, neuralgia, locomotor ataxia, muscular spasm (wry-neck), facial muscles (tic convulsif).



**Method.**—General anesthesia; expose the nerve; stretch by hooking up (finger, tenaculum, aneurysm needle). The great sciatic nerve has been stretched by forcible flexion of

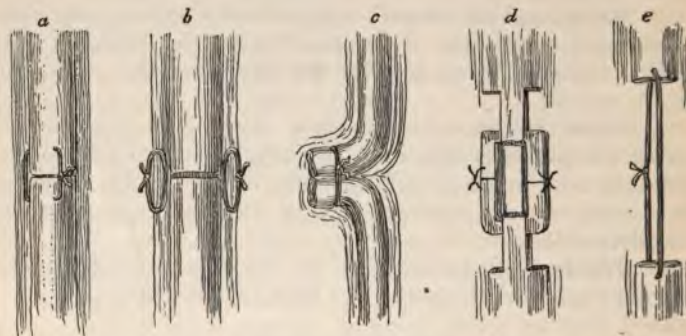


FIG. 284.—Nerve-suture: *a*, Direct; *b*, perineurotic; *c*, paraneurotic; *d*, *e*, neuroplasty (Senn).

the thigh upon the hip while the leg is extended at the knee.  
*Dangers:* Rupture of ham-string muscles; hemorrhage.

## SPINAL CORD.

### SPINAL MENINGITIS.

(Spinal Leptomeningitis.)

**Definition.**—Inflammation of the spinal pia mater.

**Etiology.**—Exposure, traumatism, infectious fevers, diathesis.

**Pathology.**—*Acute.*—The membrane is congested and adherent; increased fluid in arachnoid space.

*Chronic.*—Membrane thickened and fused.

**Symptoms.**—*Acute.*—Fever; may begin with a chill; pain and tenderness along the course of the spinal cord; rigidity of spinal muscles; increased reflexes, followed by paralysis (exudate).

*Chronic.*—Pain, tenderness, progressive wasting with loss of power, anesthesia.

**Treatment.**—*Acute.*—Rest, cold, heat, leeches, cups. Chloral, bromids, morphin.

*Chronic.*—Mercurial inunctions, counterirritation (blisters, cautery); potassium iodid.

**Prognosis.**—Guardedly favorable for acute; guarded for chronic.

### CHRONIC SPINAL PACHYMEINGITIS.

(Internal Pachymeningitis; Cervical Hypertrophic Pachymeningitis.)

**Definition.**—Chronic inflammation of the dura of the cord (Fig. 285).

**Etiology.**—Male sex, middle life, exposure (cold and



FIG. 285.—Tuberculous pachymeningitis secondary to spinal caries (Stengel).

wet), traumatism, alcohol, syphilis, tuberculosis (Pott's disease).

**Pathology.**—Membranes thickened, opaque, adherent, increased fluid; cervical region most often affected; inflammation may extend to cord (myelitis) or peripheral nerves.

**Symptoms.**—Sharp pain radiating to the extremities; loss of power; wasting; anesthesia. The disease may last two or more years.

**Treatment.**—Enforced rest; counterirritation; actual cautery. Bromids, morphin, antipyrin, iodid of potassium.

### MYELITIS.

**Definition.**—Inflammation of the spinal cord.

**Morphology.**—(a) Acute; chronic. (b) Transverse, transverse section affected. (c) Diffuse, vertical section. (d) Central, gray matter affected.

**Etiology.**—Exposure, traumatism, alcohol, syphilis, infectious fevers, new growths.

**Pathology.**—The membranes are swollen, opaque, adherent; the cord is red and soft; fusion of the columns with destruction of nerve elements; hemorrhagic effusions (hematomyelitis). In chronic form cord is contracted, nerve elements being replaced with connective tissue.

**Symptoms.**—Fever, tenderness, pain (girdle-pains), irritation (convulsions), later paralysis from compression, anesthesia, incontinence of urine and feces, bed-sores.

**Treatment.**—Rest, cold, wet-cups. Ergot, belladonna, quinin, mercury. In chronic form strychnin, arsenic, phosphorus, mercury, iodid of potassium; counterirritation (blisters, cautery).

**Prognosis.**—Always grave.

#### HEMORRHAGE.

**Etiology.**—Traumatism (wounds, blows, falls); exposure; infectious fevers; alcohol; syphilis.

**Pathology.**—May be extramedullary, intramedullary. Hemorrhage may be absorbed, organize, become an abscess.

**Symptoms.**—Extramedullary: Marked pain, nervous irritation (spasm); later, paralysis from compression. Intramedullary: paresthesia (tingling, numbness, causalgia); anesthesia; incontinence of urine and feces; loss of motion; wasting.

**Treatment.**—Rest, catheterism, cold, heat, leeching, cups; later, massage, friction, electricity, counterirritation, trephining (laminectomy). Constitutional: Ergot, potassium iodid.

**Prognosis.**—Guarded.

#### NEW GROWTHS.

Occur chiefly in the sacral region; may be lipoma, dermoid cysts, fetal malformation.

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (8), grooved director, aneurysm needle, needles, chisels, mallet, trephine.



**Treatment.**—Excision when symptoms of compression develop; caution needed in selection of proper cases for operation.

**Prognosis.**—Uncertain.

### SPINA BIFIDA.

(Hydromyelia.)

**Definition.**—Congenitally arrested growth of the spinal column giving rise to protrusion of the membranes of the cord.

**Morphology.**—(a) Spinal meningocele (consists of protruded membranes and fluid contents—cerebrospinal fluid); (b) meningocele (membranes, cord, fluid); (c) syringomyelia, syringomyelocele (medullary canal forms cavity of the sac).

**Pathology.**—Primary defect in the development of the mesoblast; involvement of the cord occurs in 95 per cent. of known cases. Fifty per cent. of all cases occur in lumbar region; 12 per cent. in lumbosacral; 27 per cent. in sacral region.

**Symptoms and Diagnosis.**—Central position; a tumor of varying size; may be single, lobulated, multiple, sessile, or pedunculated; skin or membranous covering opaque or translucent, tense and elastic (increased by crying or coughing) when the child is erect; fluctuation present at times; pressure transmitted to fontanelles; may be partially reduced and bony margin determined; tumor softens during inspiration. Owing to traumatism or thinness of the wall rupture may have occurred (orifice or ulceration from which spinal fluid is discharging will be presented).

**Complications.**—Hydrocephalus; talipes; paraplegia.

**Implements.**—Trocár and cannula, hypodermic syringe and needle, scissors, scalpel, dissecting forceps, hemostats (6), needle.

**Treatment.**—Moderate, persistent pressure (compress and elastic bandage); tapping, injection (R. Iodin, gr. x (0.666 gm.), potassium iodid, 3j (4 gm.), glycerin, f5j (32 c.c.); excision.

**Dressing.**—Seal wound with collodion; chloroform and

rubber tissue ; gauze ; adhesive-plaster straps (support) and bandage. Prevent loss of cerebrospinal fluid during early days by inclined position (head lowered).

**Prognosis.**—Guarded. Operation is futile in associated hydrocephalus.

## BRAIN.

### SURFACE MARKING OF THE SKULL.

**Asterion.**—Junction of occipital, parietal, and temporal bones.

**Basion.**—Midpoint of anterior boundary of foramen magnum.

**Bregma.**—Junction of the sagittal and coronal sutures.

**Inion.**—External occipital protuberance.

**Nasion.**—Junction of nasal and frontal bones.

**Lambda.**—Junction of the sagittal and lambdoid sutures.

**Ophryon.**—On the level with upper border of the eyebrows ; corresponds nearly to the *glabella* (the smooth swelling between the eyebrows).

**Gonion.**—Angle of the lower jaw.

**Obelion.**—Sagittal suture between the parietal foramina.

**Pterion.**—At the junction of the frontal, parietal, squamous, and greater wing of the sphenoid bones.

**Stephanion.**—Ridge at intersection of coronal suture and temporal fascia.

### CEREBRAL LOCALIZATION.—FISSURES AND SINUSES.

**Fissure of Bichat.**—Between the cerebrum and the cerebellum. *Guide* : Line through the external auditory meatuses passing through the inion.

**Median Fissure.**—Separates the hemispheres. *Guide* : From  $\frac{1}{4}$ – $\frac{1}{3}$  inch (0.62–0.83 cm.) to the right of the median line in right-handed individuals ; the same distance to the left in the left-handed.

**Superior Longitudinal Sinus.**—*Guide* : A line parallel to the median line of the skull,  $\frac{1}{4}$ – $\frac{1}{3}$  inch (0.62–0.83 cm.) from it upon either side.

**Fissure of Rolando.**—Commences  $\frac{1}{2}$  inch (1.25 cm.)

behind a point midway between the glabella and inion and extends downward at an angle of 67 degrees.

**Chiene's Method.**—Fold a square of paper diagonally, producing an angle of 45 degrees; refold one-half, producing 22.5 degrees, which, when reopened, forms 67.5 degrees. Apply from median line, measuring  $3\frac{3}{8}$  inches downward and forward.

**Broca's Method.**—By the use of a flexible square locate the bregma; measure back 5.5 cm. (5 cm. in female); reach the upper end of the fissure; draw a horizontal line 6 cm. from the external angular process of the frontal bone, at the beginning of the temporal ridge; erect a perpendicular 3 cm. long at the end of horizontal line; locate lower end of fissure.

#### CENTERS.

**Leg.**—Upper third of convolutions about the fissure of Rolando (Figs. 286, 287).

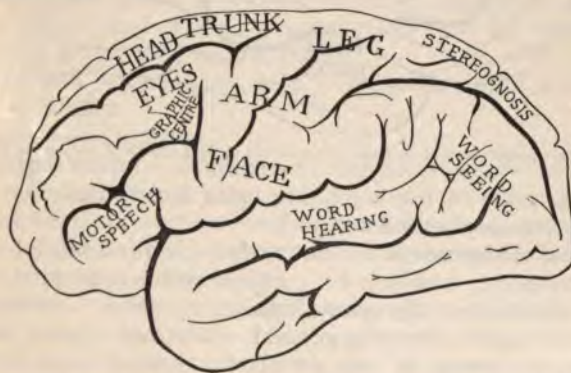


FIG. 286.—Localization of various centers on the outer surface of the left side of the human brain.

**Arm.**—Middle third of the convolutions, both sides of the fissures (shoulder center highest situation).

**Face, Mouth, Larynx.**—Lower third of the convolutions about the fissure.



**Speech (Broca's Center).**—In front of the end of the Rolandic fissure and anterior limb of the Sylvian fissure.

**Vision.**—Situated in the cuneus, supramarginal and angular gyri associated.

**Fissure of Sylvius.**—*Guide* : Line drawn from external angular process of frontal bone toinion; locate lower end of fissure upon this line at a point  $1\frac{1}{2}$  inches (3.75 cm.) from the external angular process; fissure runs from this point on a line drawn to the parietal eminence. Anterior (ascending) limb extends upward from  $\frac{1}{2}$ —1 inch (1.25—2.5 cm.)



FIG. 237.—Localization of various centers on the median surface of the human brain.

from the point of the beginning upon Reed's base line (near the squamosphenoid sutures).

**Mental disturbances** include: *Aphasia* (*aphemia*), loss of word-memory, inability to comprehend words or to give them utterance. *Agraphia*, inability to write. *Alexia*, inability to read. *Apraxia*, general symptoms giving rise to loss of perception of any or all the senses; also loss of memory of the nature and uses of surrounding objects (mind-blindness, visual amnesia). *Word-deafness*, loss of power to interpret spoken language. *Word-blindness*, loss of power to interpret written language. *Paraphasia*, loss of power of the correct use of words. *Amnesic aphasia*, loss of word-memory. *Mind-deafness* (auditory amnesia), loss of power to interpret sounds.

## INJURIES.

**Caput succedaneum.**—**Definition.**—Serous infiltration occurring beneath the scalp of new-born.

**Etiology.**—Compression of presenting part.

**Treatment.**—Is rapidly absorbed; no treatment required.

**Cephalohematoma.**—**Definition.**—Tumor formation beneath the scalp of the new-born, due to subpericranial hemorrhage from laceration following compression.

**Treatment.**—Non-interference unless hemorrhage is excessive (employ cold; compression) or suppuration occurs (incision; drainage).

**Prognosis.**—Guarded.

**Concussion.**—**Definition.**—Laceration of the brain.

**Etiology.**—Blows, falls.

**Pathology.**—Laceration of brain tissues and hemorrhage; membranes opposite point of impact may be torn (injury by counterstroke).

**Symptoms.**—Shock, unconsciousness, delirium, incontinence (urine and feces); reaction followed by vomiting, headache, fever, convulsions, coma.

**Treatment.**—Rest, quiet, heat. Aromatic spirits of ammonia; liquid diet.

**Prognosis.**—Guarded.

**Compression.**—**Etiology.**—Traumatism, new growths, foreign bodies, hemorrhage.

**Symptoms.**—Complete unconsciousness; face congested; pulse full and slow; respirations full, deep, and noisy; pupils irregular; hemiplegia.

**Diagnosis.**—*Concussion*: temporary unconsciousness; pallid face; rapid and weak pulse; rapid and shallow respirations; irregular pupils; no paralysis. *Apoplexy*: Age, condition of arteries, absolute unconsciousness, stertor, hemiplegia, or complete paralysis. *Uremia*: History; temperature, odor of the breath (urinous); high arterial tension with accentuated second sound; casts and albumin in urine; albuminuric retinitis; absence of other cause. *Opium-poisoning*: Stupor, coma, pin-head pupils, slow pulse and respiration, no paralysis; final stage: the pulse becomes rapid and

feeble, respirations shallow and irregular, pupils dilated. *Alcoholism*: History; condition of arteries; stupid; pupils slightly contracted; no paralysis; temperature subnormal.

**Treatment.**—Trepine and treat the cause.

**Prognosis.**—Guarded.

### INFLAMMATION.

**Basilar Meningitis; Acute Hydrocephalus; Tuberculous Meningitis.**—**Definition.**—Inflammatory reaction of the cerebral meninges to the tubercle bacilli.

**Etiology.**—Tubercle bacilli; may be primary in children, secondary to other foci in adults.

**Pathology.**—Meninges of pons, crura, and medulla especially involved; infiltration, softening, tuberculous nodules.

**Symptoms.**—Begins insidiously; slow fever; hypersensitiveness to light and sound; "hydrocephalic cry" (screaming cry); pulse early rapid, later slow and irregular, finally rapid and irregular; wasting, retraction of abdominal walls, rigidity of cervical muscles, contracted pupils; convulsions; later paralysis (pressure), red line following finger drawn across skin surface (*tâche cérébrale*); pulse rapid and irregular; irregular breathing (Cheyne-Stokes); fall of temperature.

**Treatment.**—Rest; quiet; iodoform ointment; cold. Chloral, bromid of potassium, opium, ergot, potassium iodid.

**Prognosis.**—Fatal.

**Meningitis of the Convexity; Acute Leptomeningitis; Simple Leptomeningitis.**—**Definition.**—Inflammation of the pia mater and arachnoid (arachnoiditis).

**Etiology.**—Traumatism; sunstroke; middle-ear disease, infectious fevers, rheumatism, kidney disease.

**Pathology.**—Membranes congested, thickened, and adherent; increased fluid; adjacent cortical substance softened and injected.

**Symptoms.**—Moderate, irregular fever; intense headache; hypersensitiveness to light and sound; tinnitus aurium; delirium; retraction of head; contracted pupils; recession of the abdominal walls (scaphoid abdomen); convulsions; coma. Kernig's sign; in the dorsal position the patient can



easily and completely extend the leg, while in the sitting posture the leg cannot be completely extended.

**Treatment.**—Rest; quiet; liquid diet; cold cups, leeching (applied to neck). Chloral, potassium bromid, enemata.

**Prognosis.**—Guardedly unfavorable.

**Chronic Pachymeningitis.**—**Definition.**—Inflammation of the dura mater.

**Etiology.**—Traumatism, caries (skull), sunstroke, syphilis, alcohol. Inner layer (hemorrhagic pachymeningitis), chronic heart, lung, liver, or kidney disease, alcohol, syphilis, insanity.

**Pathology.**—Membranes congested, thickened, adherent; infiltration; dilated blood-vessels; hemorrhagic effusions; atrophy of brain substance.

**Symptoms.**—Hemorrhagic variety may resemble apoplexy; headache, loss of memory; stupor; contracted pupils; local convulsions; fever.

**Treatment.**—Rest; quiet; cold; leeching; wet-cups; venesection. Salines, chloral, bromid of potassium, opium.

**Prognosis.**—Unfavorable.

#### CEREBRAL HYPEREMIA.

**Definition.**—Congestion of the brain.

**Etiology.**—Sunstroke; alcoholism; infectious fevers; gastric irritation; chronic heart, lung, kidney, liver disease; overwork combined with excess; menopause.

**Pathology.**—Engorgement of blood-vessels of brain and membranes.

**Symptoms.**—Headache, vertigo, hypersensitiveness (light, noise), insomnia, tinnitus aurium, retinal hyperemia, exacerbations resembling apoplexy (unconsciousness, temporary paralysis).

**Treatment.**—Rest; quiet; slight elevation of head; cold; leeching; venesection; liquid diet. Salines, bromid of potassium, chloral; treat the cause.

**Prognosis.**—Guarded.

#### CEREBRAL ANEMIA.

**Etiology.**—Chronic heart disease (aortic stenosis); general anemia; atheroma; overwork combined with excess.

Exists in shock, syncope, hemorrhage, too rapid tapping of abdomen or catheterism, ligation of carotids.

**Pathology.**—Blood-vessels contracted or lax; brain tissue pale and shrunken.

**Symptoms.**—Pallor, vertigo, headache, tinnitus aurium, dilated pupils, hypersensitiveness (sound, light), lassitude, nausea, convulsions, coma.

**Treatment.**—Rest; quiet. Aromatic spirits of ammonia, nitroglycerin, strychnin, quinin, arsenic, digitalis; treat the cause.

**Prognosis.**—Guarded.

#### ENCEPHALITIS; CEREBRITIS.

**Definition.**—Inflammation of cerebrum.

#### CEREBELLITIS.

**Definition.**—Inflammation confined to the cerebellum.

**Etiology.**—Traumatism, extension from meningeal inflammation, caries (skull), syphilis, alcohol.

**Pathology.**—Membranes congested, arachnoid white and glistening; effusion (serum, pus); brain substance softened, injected, increased fluid (ventricles, base), turbid serum, pus.

**Treatment.**—Rest; quiet; head elevated, scalp shaved; cold; cups, leeching, venesection (in robust, early in attack). Salines, potassium bromid, chloral, opium.

**Prognosis.**—Guarded.

#### CEREBRAL SOFTENING.

**Definition.**—Fatty granular degeneration of brain substance.

**Etiology.**—Prolonged cerebral anemia or congestion.

**Pathology.**—Portion affected dull-white or yellow, according to amount of blood present; softening (creamy fluid); destruction of nerve elements by fatty and granular degeneration.

**Symptoms.**—Failing memory, vertigo, headache, partial palsies, anesthesia, paresthesia, delusions, dementia.

**Diagnosis.**—Brain tumor; occurs in a younger subject; severe headache and choked disc may be observed.

**Treatment.**—Supportive.

**Prognosis.**—Unfavorable.

#### HEMORRHAGE; CEREBRAL APOPLEXY.

**Morphology.**—(a) Extradural (occurring between dura and skull); (b) subdural (between dura and brain); (c) cerebral (within the brain substance).

**Etiology.**—Traumatism, heredity, convulsions (children), atheroma, diathesis, lead-poisoning, alcohol, syphilis.

**Pathology.**—Extradural (rupture of middle meningeal artery) (Fig. 288); subdural (left middle cerebral commonly



FIG. 288.—Hemorrhage from the middle meningeal artery (Jacobson).

involved); cerebral (internal capsule). In children the hemorrhage is commonly cortical. If recent, clot is dark, soft, with staining of surrounding tissue; later clot may be absorbed (damaged brain substance replaced with scar tissue) or become cystic; straw-colored fluid; progressive degeneration of motor tract (lateral columns of cord upon opposite side).

**Symptoms.**—(a) *Traumatic*: Shock, temporary unconsciousness, consciousness (length depends upon amount and rapidity of bleeding), coma. (b) *Atheromatous rupture*: Prodromes: Headache, vertigo, disturbed sleep, tinnitus



aurium, vomiting. Attack: Sudden fall and unconsciousness, face flushed, lips blue, stertorous breathing, pulse full and slow, temperature early, falls; later rises (irritation), paralysis; head and eyes rotated to one side (conjugate deviation), flapping of one cheek, irregular pupils; rigidity of the muscles affected; failure of pulse and respiration. Muscles of the forehead and thorax usually escape; protruded tongue deviates toward paralyzed side; deep reflexes exaggerated upon affected side.

**Location of Affected Area.**—*Motor area*: ascending frontal, ascending parietal convolutions, paracentral lobe (lying along median fissure). Irritation causes convulsions; compression causes paralysis.

*Paracentral Lobule*.—Paralysis or spasm of a lower extremity.

*Central Portion of Motor Area*.—Spasm or paralysis of one arm.

*Lower Portion of Motor Area*.—Spasm or paralysis of one side of face.

*Posterior Portion of Third Parietal Convolution*.—Left side: Motor or ataxic aphasia.

*Anterior Portion of Frontal Lobes*.—Sometimes psychic disturbance.

*Temporal Lobe*.—First and second convolutions, left side: Word-deafness.

*Parietal Lobe*.—Sensory disturbance on opposite side of body.

*Angular and Supramarginal Gyri*.—Left side: Word-blindness and mind-blindness.

*Occipital Lobe*.—Hemianopia, sometimes word-blindness, mind-blindness.

*Corpus Striatum*.—If extensive, hemiplegia due to pressure upon internal capsule.

*Optic Thalamus*.—If large, hemianesthesia (pressure upon posterior limb of internal capsule), hemianopia.

*Corpora Quadrigemina*.—Hemianopia, nystagmus (staggering gait), and symptoms from pressure upon crura cerebri.

*Crus Cerebri*.—Hemiplegia, paralysis of oculomotor nerve of opposite side.

*Pons*.—Paralysis of cranial nerves; may have hemiplegia, hemianesthesia with facial paralysis upon opposite side. Bilateral or extensive effusion produces general paralysis.

*Internal Capsule (Middle Third)*.—Hemianesthesia upon the opposite side.

*Medulla*.—Paralysis of cranial nerves, difficult articulation, heart and lung disturbance, vomiting; sometimes hemiplegia.

*Cerebellum (Middle Lobe)*.—Vertigo, headache, staggering gait, vomiting.

*Sinus (Longitudinal or Lateral)*.—Rapid shock, coma, paralysis.

**Treatment**.—Trephine; select the site by the localizing symptoms; in general, trephine (*a*) one and one-quarter inches (3.12 cm.) behind the external angular process of the frontal bone, on a level with the upper border of the orbit; (*b*) just below the parietal eminence upon the same level.

*Dressing*: Drain, gauze, bandage.

**Prognosis**.—Guarded.

#### ABSCESS; SUPPURATIVE ENCEPHALITIS.

**Morphology**.—(*a*) Extradural (between skull and dura); (*b*) subdural (between dura and brain); (*c*) cerebral or cerebellar (within brain substance).

**Etiology**.—Traumatism; extension from adjacent inflammation (middle-ear disease); metastatic; infectious fevers.

**Pathology**.—Varies in size from a pea to one equaling half of a brain hemisphere; surrounding tissues hyperemic, infiltrated; may be diffuse or encapsulated (fibrous); single or multiple.

**Symptoms**.—Headache, delirium, coma, localizing phenomena.

**Treatment**.—Rest; quiet; cold; cups. Opium, chloral. Trephine; drainage.

**Prognosis**.—Guarded.

#### NEW GROWTHS.

**Morphology**.—Tubercle, glioma, sarcoma, gumma, cysts, carcinoma, fibroma, psammoma, lipoma.

**Etiology.**—Heredity, early life, male sex, traumatism, syphilis.

**Symptoms and Diagnosis.**—Headache, vertigo, vomiting (without nausea), irregular pupils, loss of memory, irritability, dementia; employ the study of localizing symptoms; x-ray, percussion.

**Treatment.**—Rest; quiet; cold. Bromids, antisyphilitic medication, chloral, opium; trephine.

**Prognosis.**—Guarded.

### FUNGUS CEREBRI.

(*Hernia Cerebri.*)

**Definition.**—A growth from connective tissue (neuroglia) of the brain after injury and infection.

**Treatment.**—Palliative; compression; excision; Dabarn has attempted to "starve" otherwise inoperable brain tumors by ligation of one or both internal carotid arteries (at separate sittings) and the injection of warm liquid paraffin into the ligated vessels.

**Prognosis.**—Guarded; healing is followed by depression (cup-like) scar.

### FOREIGN BODIES.

**Gunshot.**—**Symptoms.**—May be localizing or widespread.

**Treatment.**—Trephine; remove ball or provide drainage.

**Prognosis.**—Guarded.

### CONGENITAL MALFORMATION.

**Meningocele.**—**Definition.**—Protrusion of the membranes of the brain through a defect in the skull.

**Encephalocele.**—**Definition.**—Hernia of brain substance and membranes through a bony defect.

**Hydroencephalocele.**—**Definition.**—Brain hernia communicating with the ventricles.

**Treatment.**—Compression.

**Prognosis.**—Usually fatal.



**Hydrocephalus.**—Congenital hydrocephalus; water on the brain (Fig. 289).

**Definition.**—Dropsy of the brain.

**Etiology.**—(a) Congenital; (b) acquired (meningitis, brain-tumor, obstructed circulation).

**Pathology.**—Head enlarged and round; bones thin and translucent; sutures and fontanel enlarged; new bone-formations (Wormian bones); ventricular lining (ependyma)



FIG. 289.—Child with hydrocephalus of moderate severity (J. P. C. Griffith).

thickened and roughened; brain convolutions flattened, sulci indistinct: (a) External hydrocephalus (fluid, watery, containing a trace of albumin, is within the arachnoid space); (b) internal hydrocephalus (ventricles distended).

**Symptoms.**—Large head at birth or rapid swelling; globular shape, small face, protruded eyes, intelligence impaired, convulsions, paralysis.

**Diagnosis.**—*Rachitis*: Head square, intelligence good, other bony manifestations.

**Treatment.**—Pressure; tapping (paracentesis capitis) (ventricular, lumbar portion of the cord). The ventricles (lateral) are reached through a trephine hole,  $1\frac{1}{4}$  inches behind the external auditory meatus and the same distance above Reed's base line. A probe passed in a direction  $2\frac{1}{2}$  to 3 inches above the opposite external auditory meatus will tap both lateral sinuses. Chronic hydrocephalus has been treated by draining the ventricles into the subdural spaces (autodrainage) by means of cargile membrane wrapped about a twist of catgut.

**Prognosis.**—Guardedly unfavorable.

**Microcephalus.**—**Definition.**—Too early ossification of the skull.

**Implements.**—Trephine, rongeur forceps, scalpel, hemostats (12), needles, scissors, retractors (sharp, dull-pointed).

**Treatment.**—Longitudinal excision of bone from forehead to occiput; suture scalp. *Dressing:* Gauze, bandage.

**Prognosis.**—Guarded.

### EPILEPSY.

**Etiology.**—(a) Traumatic; (b) idiopathic (hereditary insanity).

**Treatment.**—*Traumatic epilepsy:* Limited to excision of scar if bones found uninjured; trephine if localizing symptoms present. *Idiopathic:* (a) Jacksonian epilepsy (local spasm without loss of consciousness); (b) focal epilepsy (general epileptic attack commencing in the same group of muscles). Trephine and excision of diseased centers after repeated observations.

**Prognosis.**—Always guarded.

### INVETERATE HEADACHE.

Trephining may be proposed as a last resort (medication failing) in these cases for diagnostic purposes (possible bone disease). The dura should be opened for further examination; trephine button not replaced.

**INSANITY.**

Trephining may be performed in carefully selected cases after observation leading to localization of symptoms.

**IMBECILITY.**

**Arrested Development.**—Trephining has proved futile in these cases (not including microcephalus).



## CHAPTER XXI.

### SURGERY OF THE DIGESTIVE ORGANS.

#### MOUTH.

**Harelip.**—**Definition.**—Congenital malformation of the upper lip due to non-union of the mesial nasal process with the superior maxillary process.

**Morphology.**—(a) Single (Fig. 291); (b) double (Fig. 290) with or without associated cleft-palate, fissure of the cheek



FIG. 290.—Double harelip before operation (Graham).

FIG. 291.—Single harelip before operation (Graham).

or eyelid. Median fissure has been noted (said to be a slow growing adenoma of the lip); diagnose by the history (is not congenital).

**Treatment.**—Correction of the deformity by plastic operation. Operate before the first dentition; after six weeks if feeding is difficult.

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (6), periosteal elevator, needles, pins.

**Method.**—General anesthesia; cleanse surfaces as for

aseptic operation ; separate lip from gum ; pare edges, turning down flaps ; suture, leaving a distinct projection at the bottom of the site of the fissured lip ; pins (two or three inserted to, but not penetrating, the mucous lining of the mouth ; retained by figure-of-eight turns with a silk thread may be used instead of sutures) ; retention button suture to the cheek or adhesive-plaster straps. Control the bleeding by finger compression, sutures, hemostats.

**Prognosis.**—Favorable if not infected and sufficient tissue has been left in everted flaps to allow for contraction.

**Double Harelip.**—**Treatment.**—Perform the double operation, fracturing and restoring the intermaxillary projection or excising it and treating as a single fissure (Fig. 292).



FIG. 292.—Operation for double harelip.

**Cleft-palate.**—**Definition.**—Congenital fissure of the hard or soft palate.

**Treatment.**—(a) **Staphylorrhaphy** (closure of a cleft in the soft palate).

**Method.**—General anesthesia ; head low (prevents entrance of blood into the larynx) ; freshen the edges of the cleft ; suture (catgut).

**Implements.**—Mouth-gag, scalpel, scissors, dissecting forceps, tenaculum, needles, periosteal elevator.

**Prognosis.**—Guardedly favorable.

(b) **Uranoplasty** (closure of a cleft in the hard palate).

**Method.**—General anesthesia ; head low ; freshen the edges of the cleft ; dissect mucous lining and periosteum from the roof of the mouth ; make linear incisions upon both sides to relieve tension ; suture. May dissect and turn down flaps made of nasal mucous membrane and periosteum from the floor of the nose ; suture (Figs. 293, 294).

**Prognosis.**—Guarded.

**Lips.—Lip-tie.—Rare.**

*Definition.*—Congenital shortening of the lip and alveolar septum (upper lip).

*Treatment.*—Incision. A scissors and finger dissection from the gum.

**Inflammation of the Lips.—Chapped; Cracked; Fever-blister; Herpes.—Treatment.**—Vaselin, cold cream, mercurial ointment, 5 to 20 grain silver-nitrate solution.



FIG. 293.—The edges of the cleft are being pared with a probe-pointed bistoury after passing the sutures. It is better to pare the edges before passing the sutures (Bernard and Huette).



FIG. 294.—The sutures being fastened, the lateral incisions (a, b) are made to relieve tension by division of the tensor palati muscles (Bernard and Huette).

**New Growths.—Epithelioma.—Diagnosis.**—Male sex, after forty, lower lip, slow growth, beginning in a fissure or as a warty tubercle; induration; late involvement of glands; does not improve under medical treatment.

**Cysts.—Diagnosis.**—Appear as single or multiple, round or oval, swellings; tense; inelastic; translucent; contain mucus; occur more often behind the lower lip.

**Hypertrophy; Double Lip; Macrocheilia.**—Characterized by symmetric thickening throughout the lip.

**Nevus.**—Occurs as a small purplish or reddish compressible outgrowth tending to enlarge; congenital.



**Treatment.**—General or local anesthesia; excision (longitudinal V-shaped in hypertrophy); formation of new lip by plastic operation (cheiloplasty). Control bleeding by hemostats, finger compression, sutures.

**Implements.**—Scalpel, scissors, dissecting forceps, tenaculum, hemostats (6), needles.

**Stomatitis.**—**Definition.**—Inflammation of the mouth.

**Etiology.**—Traumatism, drugs (mercury); infection; diathesis.

**Symptoms.**—Heat, pain, swelling, fetid breath, discharge (salivary, mucopurulent), ulceration, adenitis, gangrene.

**Treatment.**—Cracked ice; irrigation with boric-acid solution; potassium-chlorate wash; hydrogen dioxid; iodid of potassium (for ptyalism); cauterization (cancrum oris). Constitutional: Salines, tonics; treat the diathesis.

**Prognosis.**—Favorable in all but gangrenous forms.

**Abscess (Gum-boil).**—**Etiology.**—Traumatism; caries of teeth.

**Symptoms.**—Pain (throbbing), swelling, salivation.

**Treatment.**—Hot fomentation; incision with guarded bistoury; irrigate with hydrogen dioxid; treat any decayed teeth.

**Prognosis.**—Favorable.

**Retropharyngeal Abscess (Postpharyngeal Abscess).**—**Definition.**—Purulent collection in the wall of the larynx.

**Etiology.**—Foreign body; caries of vertebra; sequelæ to infectious fevers.

**Symptoms.**—Fever (hectic), redness, swelling, fluctuation, painful deglutition; stiffness and tenderness of throat muscles.

**Treatment.**—(a) Free incision within the mouth with a guarded bistoury; head lowered; irrigation with boric-acid solution; (b) general anesthesia; external dissection from behind the sternomastoid muscle. Constitutional: Treat the cause; tonics.

**Prognosis.**—Guarded.

**Epulis.**—**Definition.**—Outgrowth from the gum. May be—(a) Simple (fibrous), arising from the alveolar periost-

teum; (*b*) malignant (myeloid), vascular (purplish color), of rapid growth, tending to become fungous.

**Treatment.**—Free excision.

**Implements.**—Scalpel, scissors, dissecting forceps, mouth-gag, extracting forceps, saw, cutting and rongeur forceps, cautery.

**Prognosis.**—Favorable if completely removed.

**Toothache.**—**Etiology.**—Neuralgia; dental caries.

**Treatment.**—If the pulp is exposed: Oil of cloves, carbolic acid, creasote, cocain, or chloroform applied upon a cotton pledget; tincture of aconite and tincture of iodin applied to the gums; dry heat. Extraction of the offending teeth when filling is inadvisable.

**Method.**—Grasp firmly with forceps close to the root; (*a*) teeth with single fangs (canine, incisors) loosen by rotating before pulling. (*b*) Teeth having double roots (bicuspid, molars) loosen by a prying, swaying movement. May dissect the gum away from the neck of the tooth with a guarded (cotton or adhesive strap wrapped) sharp-pointed bistory after anesthetizing the parts (cocain).

## PAROTID GLAND.

**Parotitis.**—**Definition.**—Inflammation of the parotid gland. May be—(*a*) Simple mumps; (*b*) true parotitis. The skin is tense and swollen, pain on chewing, symptoms not marked when following typhoid fever or typhus.

**Treatment.**—**Local.**—Heat, cold, hot fomentations, poultice, incision, antiseptic mouth-wash (boric acid, hydrogen dioxid).

**General.**—Tonics, supportive. When lanced, portions of the parotid gland come away; is followed by depression and cicatrization.

**Prognosis.**—Guarded. Death may result from exhaustion.

**Salivary Fistula.**—Commonly occurs along the course of parotid duct.

**Etiology.**—Traumatism, ulceration, and suppuration of parotid gland or duct. Discharge is increased by mastication.

**Treatment.**—Cocain anesthesia. (*a*) Connect the fistula with the mouth-cavity by probe and incision (Fig. 295); enlarge by daily probing through the mouth; stimulate the external wound to close by application of silver nitrate; (*b*) with a curved needle ligate the duct above the external



FIG. 295.—De Guise's operation for salivary fistula (Esmarch and Kowalzig).

opening from within the mouth (suture cuts through during the course of from four to six days).

**Implements.**—Scalpel, probe, needle, mouth-gag.

**Prognosis.**—Favorable.

### SALIVARY CYSTS.

Occur generally upon the floor of the mouth.

**Etiology.**—Congenital; obstruction of the ducts (salivary calculi; suppuration).

**Symptoms.**—Smooth, rounded or oval, doughy swelling; translucent at times (ranula); single or multiple.

**Treatment.**—Cocain anesthesia; incision, excision from within the mouth.

**Implements.**—Mouth-gag, scissors, scalpel, dissecting forceps, tenaculum, hemostats (4), needles.

**Prognosis.**—Favorable.

**New Growths.**—May be (*a*) adenomatous cancers of glandular type; (*b*) tubular epithelioma (characterized by the presence of pearly bodies, usually non-metastatic, but



spreads widely locally); (*c*) mixed tumors (fibroma, myoma, chondroma, sarcoma, cystic), salivary concretions (calculi).

**Symptoms.**—Presence of a progressively growing tumor over site of parotid gland; concretions may give rise to inflammation, abscess, salivary fistula.

**Treatment.**—Excision by dissection.

**Implements.**—Scissors, scalpels, dissecting forceps, retractors (small, sharp- and dull-pointed), probe, grooved director, tenaculum, vulsellum forceps, hemostats (8), aneurism needle, needles.

**Method.**—General anesthesia; incision parallel to border of the lower jaw, dissect and retract soft parts. Avoid the facial nerve (usually impossible in extensive operations), carotid sheath. Ligation of the external or common carotid arteries may become necessary. Close the wound (drain if infected).

**Prognosis.**—Always guarded. Facial paralysis may call for subsequent operation for its relief (nerve grafting). Impossible to dissect out the entire parotid gland, prompt recurrence of malignant growths therefore occurs.

## TONGUE.

**Tongue-tie.**—**Definition.**—Congenital shortening of the frenum of the tongue.

**Treatment.**—Incision through the frenum with scissors or guided by handle of grooved director.

**Implements.**—Mouth-gag, scissors, and a grooved director.

**Glossitis.**—**Definition.**—Inflammation of the tongue.

**Etiology.**—Traumatism, diathesis, eruptive fevers, mercurial poisoning.

**Symptoms.**—Swelling, heat, salivation, adenitis.

**Treatment.**—Cracked ice, washes of boric acid, potassium chlorate, hydrogen dioxid, myrrh; scarification; rectal feeding; tracheotomy. Constitutional: Treat the diathesis, salines.

**Prognosis.**—Favorable.

**New Growths.—Macroglossia.**—*Definition.*—Congenital hypertrophy of the tongue.

*Treatment.*—Ligation; V-shaped excision of protruding part; ligate; cautery.

*Prognosis.*—Favorable.

**Epithelioma (Cancer of the Tongue).**—*Diagnosis.*—Male sex, after forty, history of smoking, alcohol, syphilis, psoriasis in a fissure or as a scaling tubercle, induration, infiltration, salivation, stiffening of tongue and throat muscles, fetor, dysphagia, hoarseness, sloughing, glandular enlargement.

**Dermoid Cysts (Dentigerous Cyst).**—*Diagnosis.*—Early life; painless, slow growth; solid tumor; defective teeth (congenital).

*Treatment.*—Excision (partial or complete); excision of tongue with removal of corresponding half of lower jaw through the mouth.

*Implements.*—Scalpel, dissecting forceps, hemostats (8), mouth-gag, tenaculum, retractors (dull, sharp-pointed), tracheotomy tube, cautery, needles, Gigli saw.

*Method.*—General anesthesia; (a) Whitehead: Draw the tongue forward by means of a retention suture passed through the tip; dissect with scissors (clipping); control hemorrhage by ligation. (b) Kocher: Through the floor of the mouth. Preliminary tracheotomy; pack the pharynx with gauze or carbolyzed sponge (control by retraction suture). Incision: From just below the tip of the ear to the middle of the anterior border of the sternomastoid muscle; forward to the body of the hyoid bone, thence extending to the jaw along the anterior belly of the digastric muscle (Fig. 296); dissect and retract soft parts; expose and ligate the lingual artery, facial artery, and veins; remove glandular tissue (salivary, lymphatic) by



FIG. 296.—Kocher's excision of tongue (Esmarch and Kowalzig).

dissection; ligate the opposite lingual artery (by external excision); reach the tongue through an incision extending along the lower jaw; excise tongue by scalpel or scissors, drawing through the opening; control hemorrhage by hemostats, ligature, cautery; close the wound. (c) A scissors dissection of the tongue, followed by excision of half the lower jaw upon the affected side, performed through the mouth.

*After-treatment.*—Rectal feeding; stomach-tube; irrigation of the mouth with boric acid, hydrogen dioxid.

*Prognosis.*—Guarded.

### PHARYNX.

#### **Pharyngitis (Sore Throat; Simple Angina).—**

**Definition.**—Inflammation of the pharynx, soft palate, and uvula.

**Etiology.**—Exposure, traumatism, diatheses, infectious fevers.

**Symptoms.**—Swelling, redness, soreness of throat, painful swallowing, dryness (hacking cough, hoarseness), stiffness and tenderness in the neck.

**Treatment.**—Hot fomentations, hot drinks, application locally:

R Potas. chlor. . . . . gr. xx (1.333 gm.).  
 Tinct. ferri chlor. . . . . f $\frac{3}{4}$ ss (16 c.c.).  
 Glycerin . . . . . f $\frac{3}{4}$ ss (16 c.c.).  
 Aq. . . . . q. s. ad f $\frac{5}{8}$ ij (64 c.c.).

Five-grain (0.333 gm.) solution of silver nitrate; cracked ice; tinct. iodin, externally. Constitutional: Treat the diathesis; salines, tonics; improve the hygiene.

**Prognosis.**—Favorable.

### INFECTIOUS SUBMAXILLARY ANGINA.

(Ludwig's Angina.)

**Definition.**—Malignant cellulitis of the submaxillary tissues. Epidemic at times.

**Symptoms.**—Rapid onset, high fever, wide-spread inflammation.



**Treatment.**—Free incision, curettage.

**Prognosis.**—Always guarded.

### TONSILS.

**Tonsillitis (Amygdallitis; Quinsy Sore Throat; Cynanche Tonsillaris).**—**Definition.**—Inflammation of the tonsils.

**Etiology.**—Exposure, traumatism, diatheses.

**Symptoms.**—Pain, increased by swallowing and talking, tenderness beneath the angle of the jaws; fever; tonsils red, swollen, covered with—(a) Mucus; (b) yellow spots (retained and degenerated secretion); (c) phlegmonous (quinsy), one gland grows rapidly larger than the other, swelling becomes marked, with fluctuation; dyspnea.

**Treatment.**—Rest, cracked ice, five-grain (1.333 gm.) silver-nitrate solution, hydrogen dioxid, potassium chlorate; powdered bicarbonate of sodium; guaiac (gr. ij—0.133 gm.) lozenges. For chronic hypertrophy: Liquor iodi comp. (Lugol's solution), dilute acetic acid; excision (scissors, tonsillotome, cautery). Control excessive hemorrhage by purse-string ligature, passed by means of a curved needle and forceps about the base of the excavation. Internal: Dover's powder, quinin, tincture of aconite; treat the diathesis; tonics, hypophosphites.

**Prognosis.**—Guardedly favorable.

### ESOPHAGUS.

**Esophagitis.**—**Definition.**—Inflammation of the esophagus.

**Etiology.**—Traumatism (corrosive or sharp object swallowed), diatheses, by extension (thrush).

**Symptoms.**—Deep-seated pain, beginning behind the larynx, increased by swallowing.

**Treatment.**—Rest, cracked ice, milk diet, rectal feeding, stomach-tube; treat the diathesis.

**Prognosis.**—Guarded.

**Congenital Malformation.**—Formation of fistula or sacculaton.

**Etiology.**—Incomplete closure of the lower branchial clefts.

**Treatment.**—Stimulation of the fistulous opening by nitrate of silver; dissection and closure by sutures.

**Prognosis.**—Favorable.

**Foreign Bodies.**—May be impacted—(a) Behind the cricoid cartilage (narrowest part of esophagus); (b) opposite the left bronchus; (c) at the opening in the diaphragm.



FIG. 297.—Forceps in position to remove a foreign body from the gullet (Fergusson).

**Symptoms and Diagnosis.**—History; pain, dysphagia, dyspnea, hemorrhage.

**Treatment.**—Employ probang, coin-catcher (Fig. 297), esophageal forceps, esophagoscope. Incision (esophagotomy).

**Implements.**—Scalpel, scissors, hemostats (8), dissecting forceps, retractors (sharp and dull-pointed), tenaculum, needles.

**Method.**—General anesthesia; incision upon the left side of the neck (esophagus nearer the surface), between sterno-

mastoid muscle and trachea (in the same direction as for ligating the common carotid artery), from top of thyroid cartilage to sternoclavicular joint; retract or incise the omohyoid muscle; retract the great vessels, larynx, thyroid gland, recurrent laryngeal nerve; reach the esophagus; incise longitudinally; remove the foreign body (forceps, tenaculum, fingers); close the wound. When low down, a foreign body has been reached through the posterior mediastinum (after resecting three ribs upon the left side).

*Dressing.*—Gauze, bandage.

*After-treatment.*—Feed with the stomach-tube; by rectum for from three to six days. When the body is below 13 inches (32.5 cm.) from the teeth, perform a gastrotomy, exploring from the cardiac end of the stomach.

**Spasm (Esophagismus; Functional Obstruction).**

—*Definition.*—Paroxysmal contraction of the esophagus. May occur near the lower end (cardiospasm).

*Etiology.*—Predisposing causes: Female sex; hysteria; active; tetanus, hydrophobia, organic stenosis.

*Symptoms.*—Periodic dysphagia; sense of constriction without impediment to the passage of a bougie.

*Treatment.*—Systematic passage of bougies, electricity, tonics, improve hygiene.

*Prognosis.*—Guarded.

**Stenosis (Stricture).**—*Definition.*—Organic obstruction of the esophagus.

*Etiology.*—Foreign body, pressure (external tumor, aneurysm, goiter), tumor in the esophageal wall (as cancer), cicatricial contraction (traumatism, foreign body, corrosive, syphilitic ulcer).

*Symptoms and Diagnosis.*—Progressive dysphagia, regurgitation of food (may be delayed for several hours); gurgling sound heard at the back when water is swallowed; cachexia, obstruction to passage of bougie; pouching above the constriction; history.

*Treatment.*—Treat the cause; gradual dilatation with bougies (contraindicated in aneurysm, but may be cautiously used in early stages of cancer); internal esophagotomy (when high up); gastrotomy; passage of a cord from the



stomach to the mouth (or through the nose), and sawing until the stricture admits a small-sized bougie or dilator,



FIG. 298.—Abbe's method of cutting esophageal strictures.

when the stomach wound may be closed and gradual dilatation practised (Figs. 298, 299); esophagotomy (permanent

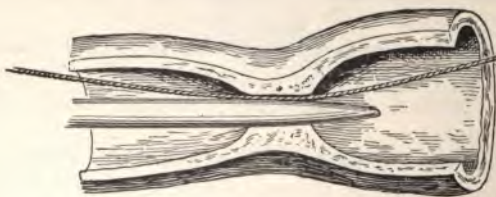


FIG. 299.—The bougie engaged in the stricture while the string-saw is being used.

operative fistula); esophagectomy (excision of diseased portion and suture of lower end to external wound); gastrotomy (permanent operative gastric fistula); rectal feeding.

**Prognosis.**—Guarded.

## STOMACH.

**Passage of Stomach or Esophageal Tube.—Method.**

—Patient sitting up or have his head and shoulders elevated; cleanse mouth cavity; chill the end of the stomach-tube (cracked ice), or spray the throat with cocain solution (2 per cent.)—lessens nausea; lubricate; employ a mouth-gag (roller bandage, cork attached to a string); pass the tube, guided by the index-finger, to the back of the pharynx; curve the tube downward past the epiglottis; direct the patient to swallow; engage the tube in the esophagus and pass it to the stomach by a rapid, steady movement.

**Gastritis (Gastric Catarrh).—Definition.**—Inflammation of the stomach.

**Etiology.**—Traumatism (foreign body, corrosive); indigestible food, especially if associated with exposure of body to cold and wet; infectious fevers; diatheses.

**Pathology.**—*Acute*: The mucous lining is red, swollen, covered with thick mucus; hemorrhages, followed by little ulcers, may occur. *Chronic*: Degeneration of the glandular elements, overgrowth of the connective tissue, or atrophy occurs.

**Symptoms.**—Pain, tenderness over the epigastrium, nausea, vomiting (food, mucus, bile, blood), thirst, jaundice (inflammatory extension to bile-ducts), fever.

**Treatment.**—Absolute rest (no food by mouth); clear the stomach (emetic, lavage); cracked ice for thirst; apply mustard-plaster, turpentine stupe, hot fomentations to epigastrium for vomiting.

- R. Calomel . . . . gr.  $\frac{1}{100}$ — $\frac{1}{12}$  (0.0006–0.005 gm.).  
 Bismuth . . . . gr. v–x (0.333–0.666 gm.).  
 Carbolic acid . . . gtt.  $\frac{1}{2}$ –ss (0.008–0.033 c.c.).  
 Cocain . . . . gr.  $\frac{1}{12}$  (0.005 gm.).  
 Silver nitrate . . . gr.  $\frac{1}{2}$ –ss (0.0008–0.033 gm.).

Opium suppositories, lavage, salines. Treat the cause. Nearly every case of chronic gastritis should wear an abdominal belt (flannel, home-made, or manufactured).

**Prognosis.**—Guardedly favorable.

**Gastralgia (Gastrodynia; Neuralgia of the Stomach).**—**Definition.**—Disease of the stomach characterized by paroxysms of severe pain without organic lesion.

**Etiology.**—Debility; excess.

**Symptoms.**—Spasmodic pain in the epigastrium, radiating to the back, relieved by pressure, food, or hot drinks.

**Treatment.**—Hot fomentations, mustard-plaster.

Hoffmann's anodyne, aromatic spirits of ammonia. Constitutional: Improve the hygiene, tonics.

**Prognosis.**—Guardedly favorable.

**Gastric Ulcer (Simple Ulcer; Peptic Ulcer; Perforating Ulcer).**—**Definition.**—Circumscribed ulceration of the stomach-wall due to digestive action of highly acid gastric juice upon a part impaired by circulatory disturbance.

**Etiology.**—Female sex, early life, overwork.

**Pathology.**—Hyperacidity and local circulatory disturbance (traumatism, hemorrhage, thrombosis, embolism, spasm) give rise to round or oval, single or multiple, ulcers; punched out (conic, with base toward the stomach; bottom is smooth and may be any one of the coats of the stomach); no inflammatory areola. Occurs commonly upon the lesser curvature or posterior wall near the pylorus.

**Symptoms and Diagnosis.**—Dyspepsia, fixed pain (increased by eating), local tenderness, vomiting, hemorrhage, increased hydrochloric acid. The blood from an ulcer is all absorbed if the intestines are normally active, but if not, then it may pass through the bowel. A chronic form of gastric ulcer may give rise to intractable gastro-intestinal disturbance, neurasthenia, hysteria.

**Complications and Sequelæ.**—Perforation, peritonitis, gastric fistula.

**Treatment.**—Absolute rest in bed, milk diet and lime-water (peptonized or dilute), oil inunctions, rectal feeding (rectal feeding may be kept up for three or four weeks at a time). Nitrate of silver, bismuth subnitrate, opium; counterirritation for pain (small blisters over the epigastrium). Excision required for—(a) Continued or profuse hemorrhage; (b) perforation; (c) stasis. Treat moderate hemorrhage by ice-pack to the epigastrium, hypodermic injection of ether, rectal



feeding, transfusion, or normal salt solution (0.7 per cent.), rectal injection high up into the bowel. A local peritonitis (secondary inflammation) may be treated expectantly (may give opium); general peritonitis as soon as diagnosed calls for operation. Perform laparotomy.

**Laparotomy (Abdominal Section; Celiotomy).—**

**Definition.**—Opening the abdominal cavity.

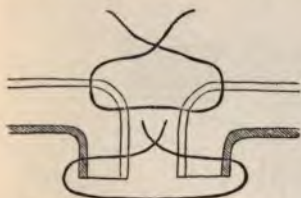


FIG. 300.—Czerny-Lembert suture.

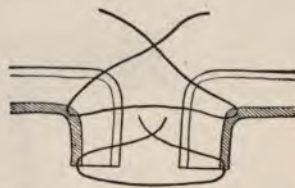


FIG. 301.—Czerny-Lembert suture as at present used.

**Implements.**—Scalpel, scissors, dissecting forceps, curet, retractors (dull), hemostats (8), needles, vulsellum forceps.

**Preparation.**—Lavage; boric-acid irrigations; rectal feeding for two or three days before operation; chloroform the preferable anesthetic (less nausea and vomiting).

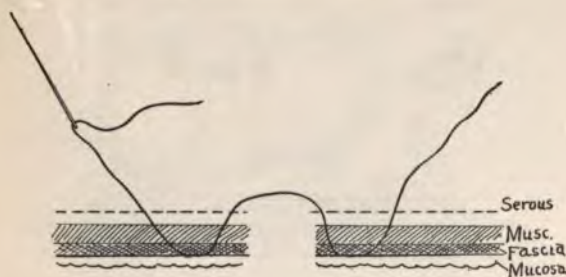


FIG. 302.—Lembert's suture.

**Method.**—General anesthesia; prepare the surface as for an aseptic operation; median incision (ensiform to umbilicus); retract soft parts, opening the peritoneum; draw the stomach forward; locate the ulcer (hydrogen dioxid passed into the

stomach by means of tube); scrape, tie bleeding vessels, suture—*Gastrorrhaphy*: Method—(a) Czerny, deep sutures so passed as to bring peritoneal lips of wound together (fine silk or catgut, 4 to 8 to the inch—2.5 cm.), interrupted or continuous (Figs. 300, 301); (b) Lembert, superficial sutures passed (4 to 8 to an inch—2.5 cm.) so as to bring the serous

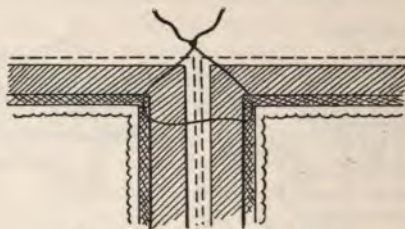


FIG. 303.—Lembert's suture closed.

surfaces together (Figs. 302, 303). If unable to locate the ulcer, perform a gastrotomy (first packing the surrounding peritoneal cavity and examine the stomach interior; suture after excising the ulceration; close the gastrotomy wound; close the peritoneum (using silk or fine catgut); suture



FIG. 304.—Securing dressing in laparotomy wound.

the external wound in layers or as a whole. Treat gastric fistula by cauterization; dissection down to the stomach orifice; excision; gastrorrhaphy.

**Dressing.**—Collodion, gauze, cotton, adhesive straps, bandage (Fig. 304).

*After-treatment.*—Rectal feeding during the first four to six days.

**Prognosis.**—Guardedly favorable.

**Foreign Bodies.**—**Treatment.**—(a) *Vienna Method*: Diet of mashed potatoes for two to four days; (b) *Gastrotomy*: Method—General anesthesia; lavage (boric-acid solution); incision (median, from ensiform to umbilicus); open peritoneum; retract soft parts; protect peritoneal cavity by pads or gauze; locate foreign body by palpation; incise the stomach transversely over its long axis with scalpel or scissors; remove the foreign body; close the wound in the stomach by Czerny-Lembert sutures; close the abdominal wound.

**Dressing.**—Collodion, gauze, cotton, folded towel, adhesive straps, bandage.

*After-treatment.*—Rectal feeding for from four to six days.

**Prognosis.**—Guardedly favorable.

**Gastrectasia (Gastrectasis).**—**Definition.**—Dilatation of the stomach.

**Etiology.**—Pyloric obstruction; relaxation (gastroptosis) from gluttony, atony. Congenital dilatation (called megio-tasia).

**Symptoms and Diagnosis.**—Dyspepsia, vomiting (long after eating, excessive in quantity, fermented); obstinate constipation. Vomited matters settle in three layers (granular at the bottom, dirty gray fluid above, frothy at the top); find vast numbers of *Sarcinae ventriculi* (a yeast fungus).

**Examination.**—Bulging over epigastrium, increased gastric tympany, splashing (felt and heard); esophageal sound passes from 25.5–29.5 in. (65–75 cm.).

**Treatment.**—Restricted diet; lavage; electricity; dilatation of the pylorus (Loretta's operation): consists of (a) Gastrotomy; (b) digital dilatation of the pylorus; tucking or folding the dilated greater curvature and suturing (gastrorrhaphy); excision of the dilated greater curvature with suturing.

*After-treatment.*—Rectal feeding for from three to six days; tonics, strychnin; abdominal belt.

Nutrient enemata:



R. Milk . . . . . (5ij (64 c.c.).  
 Soda carbon. . . . . gr. v-x (0.333-0.666 gm.).  
 Yolk of one egg.

M. Sig.—Inject high into the bowel after an irrigation three times a day.

R. Peptonized milk . . . . . (5ij (64 c.c.).  
 Sig.—Inject high into the bowel by means of a rectal tube after flushing out the rectum.

**Prognosis.**—Guarded.

**Gastropotosis.**—**Definition.**—Stomach out of place. When all the abdominal viscera are displaced, then called *enteropotosis* or *splanchnoptosis*.

**Etiology.**—Tight lacing (occurs in young soldiers from



FIG. 305.—Carcinoma of the cardiac end of the stomach; extension into duodenum: S, Dilated esophagus; K, ulcerated carcinoma; G, a perforating ulceration; M, stomach (Orth).

tight jackets or belts); traction from an enlarged spleen (pulls upon the pancreas, duodenum, and pylorus); tumors; absorption of the mesenteric or peritoneal fat.

**Symptoms.**—May or may not be present; pain, vomiting (due to angular deformity of the duodenum). Chlorosis is usually associated with the condition.

**Treatment.**—Rest, abdominal binder, improve the hygiene (clothing should be suspended from the shoulders); laparotomy with gastrorrhaphy may be considered.

**Prognosis.**—Guarded.

**Gastric Cancer.**—May be: (a) Hard (scirrhus, Fig. 305); (b) soft (medullary); (c) epithelioma; (d) colloid (mucoid).

**Etiology.**—Predisposing causes, male sex, middle life, heredity, gastric ulcer.

**Pathology.**—Commonly, primary or scirrhus variety gives rise to pyloric obstruction and dilatation.

**Symptoms and Diagnosis.**—Continuous pain, tenderness, vomiting (partially digested food, coffee-ground blood), absence of hydrochloric acid, presence of lactic acid (test after giving an oatmeal soup or gruel meal: lactic acid gives a yellow reaction to a solution of ferric chlorid which has



FIG. 306.—Billroth's method of pylorotomy.



FIG. 307.—Pylorotomy.

been slightly carbolated (rendered blue); presence of tumor (hard, lobulated), involvement of lymph-glands, anemia, cachexia. When dilatation is present, have vomiting of large quantities of fermented food, presence of *sarcinae ventriculi*; increased area of gastric tympani, reversed peristaltic wave (noted upon inspection). The outline of the stomach may be roughly made out by having the patient swallow water and auscultating over the epigastrium at the same time.

**Treatment.**—Rest, liquid diet (use predigested food, give little or no carbohydrates); give eggs, milk, broth, scraped meat; pepsin and hydrochloric acid to aid digestion; lavage (given every day or every other day). Use boric acid or carbolic-acid solution, also salicylic solution in 1:3000

strength; morphin for the pain—habit formation is not important, although the disease will progress more rapidly when this drug is used; excision (pylorectomy, Figs. 306, 307).

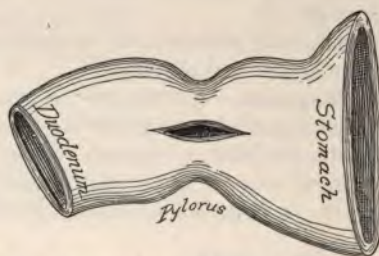


FIG. 308.—Heineke-Mikulicz's pyloroplasty: the incision.

**Pylorectomy.**—*Method.*—Transverse or median incision; control the hemorrhage; reach the peritoneum; open and retract; pack the peritoneal field with pads or gauze; draw the pylorus forward; excise the growth, ligating and excising the infected portion of omentum; suture (a) duode-

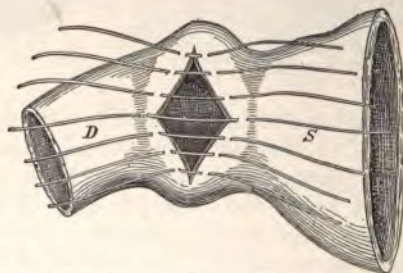


FIG. 309.—Heineke-Mikulicz's pyloroplasty. The axis of the incision is changed by traction from horizontal to vertical; sutures in position; only one of the two rows of sutures is shown.

num to the stomach (Czerny-Lembert sutures); (b) close both incisions (Czerny-Lembert); perform a gastro-enterostomy.

*After-treatment.*—Rectal feeding for from four to six days.

**Pyloroplasty.**—Formation of a new pylorus (Figs. 308–310).



*Method.*—Longitudinal incision through the stricture extending into the stomach and duodenum; draw the end of the wound together by transverse suturing; complete by double row of sutures (Czerny-Lembert).

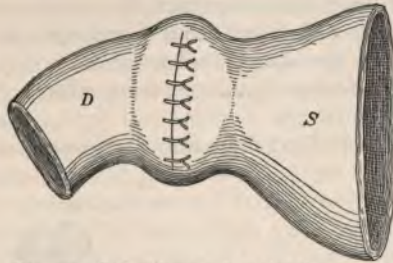


FIG. 310.—Pyloroplasty: after tying the sutures.

**Gastro-enterostomy** (Fig. 311), operation designed to establish a functional communication between the stomach and intestine after pyloric obstruction.

*Method.*—Median incision from ensiform to navel; open peritoneum; retract; pack peritoneal cavity; draw stomach



FIG. 311.—Gastro-enterostomy (Rockwitz).

forward; longitudinal incision 3 inches (7.5 cm.) long in anterior wall; control hemorrhage by continuous suture; locate the upper portion of the small intestine (plica duodeno-jejunalis) by following up or down the intestinal loops from

the loop first presented (intestine becomes paler and thicker as it ascends toward the duodenum); reverse the loop (to secure direct peristalsis and prevent "vicious cycle"); incise 3 inches (7.5 cm.) and apply a continuous suture (control hemorrhage); unite to stomach by—(a) Czerny-Lembert sutures; (b) Murphy button (attach by purse-string sutures); (c) elastic ligature (McGraw) and Lembert suture; replace the viscera; close the abdominal wound.

*Dressing.*—Collodion, gauze, cotton, adhesive straps, bandage.

*After-treatment.*—Rectal feeding for from four to six days.



FIG. 312.—Witzel's method of gastrostomy: tube in position; sutures ready to tie.



FIG. 313.—Witzel's method of gastrostomy: tube in position; sutures ready to close abdominal wall.

*Prognosis.*—Guarded. Formation of a vicious cycle (reversed peristalsis) will defeat the end sought.

**Gastrostomy** (Figs. 312, 313).—**Definition.**—The formation of a gastric fistula through the anterior abdominal wall.

**Implements.**—Scissors, scalpel, hemostats (8), dissecting forceps, retractors (dull), needles, vulsellum forceps, tenaculum.

**Method.**—General anesthesia; prepare the surface as for an aseptic operation: (A) *Fenger's Method*: Incision from 3-

4 inches (7.5–10 cm.) long, parallel to the costal arch; open the peritoneum; suture the peritoneum to the skin surface; retract; draw the stomach forward; locate the cardiac end; suture the stomach to the skin surface; incise and insert a small tube or open after from four to six days (to protect the peritoneal cavity). (B) *Witzel's Method*: Incision to the left of the median line, curved through the rectus muscle; open the peritoneum; retract and bring the cardiac end of the stomach forward; incise the stomach and insert a small rubber tube; suture two folds of the stomach over the tube for a distance of two inches; suture the upper ends of the folds to the external parts of the wound; close the lower ends of the abdominal wound (tube may be left in position or inserted for feeding—Figs. 312, 313). (C) *Hahn's Method*: Expose the stomach by Fenger's incision; incision through the skin surface of the eighth intercostal space upon the left side; dissect the space and suture the stomach to the upper skin-surface incision; close the lower abdominal wound; open the stomach through the upper wound after a period of from four to six days.

**Dressing.**—Gauze, cotton, bandage.

**Prognosis.**—Guardedly favorable.

## INTESTINES.

**Enteritis.**—**Definition.**—Inflammation of the intestine.

**Etiology.**—Warm weather; indigestible food; exposure; corrosives; traumatism; foreign bodies.

**Pathology.**—Mucous membrane red, swollen, covered with mucus; hemorrhages with little ulcerations may occur about the solitary and agminated glands. In chronic enteritis thickening or atrophy of the mucous membrane occurs.

**Symptoms.**—Frequent stools containing undigested food (lientary), serum, mucus, blood; colicky pain; abdominal gurgling (borborygmi); coated tongue; loss of appetite; fever or collapse.

**Treatment.**—Rest; liquid diet. Calomel, castor-oil purge for retained material; follow with bismuth; opium; salol.

**Prognosis.**—Usually favorable.



**Enterocolitis (Follicular Enteritis).—Definition.**—Intestinal inflammation mainly affecting the lymphatic glands of the ileum and colon.

**Etiology.**—Generally follows catarrhal enteritis.

**Pathology.**—Mucous membrane is red, swollen, covered with mucus, with hemorrhages and ulcerations of the glandular tissue.

**Symptoms.**—Vomiting; frequent stools (yellow, green, mucous, blood, partially digested particles, material like chopped spinach); the belly is swollen; tenderness along the colon; fever; rapid wasting.

**Treatment.**—Rest; liquid diet. Bismuth, salol, nitrate of silver, opium; Locally: Mustard or spice plaster; daily irrigation—(a) pint to two quarts (512 c.c.—2.04 L.) of benzoate of sodium solution (1 per cent.), salicylic acid (1 per cent.), boric acid (5 per cent.); follow with (b) injection of from 1 to 4 ounces (32–128 c.c.) of water containing silver nitrate (gr.  $\frac{1}{4}$ –1—0.166–0.666 gm.) to the ounce (32 c.c.).

**Prognosis.**—Guarded.

**Appendicitis.—Definition.**—Inflammation of the vermiform appendix. May be associated with—(a) Cecitis (inflammation of cecum); (b) perityphlitis (inflammation of the serous covering of the cecum); (c) paratyphlitis (inflammation about the cecum); (d) appendicular peritonitis (inflammation of peritoneal covering in and about the appendix).

**Etiology.**—Early life, male sex, catarrhal enteritis, traumatism, foreign bodies, constipation, fecal impaction, diarrhea, gall-stones.

**Pathology.**—Appendix is red and swollen; ulcerated or gangrenous; mucous lining is injected and thickened; presence of *Bacterium coli commune*.

**Symptoms.**—Gradual or abrupt onset; pain and tenderness in right iliac fossa, constipation, vomiting, fever.

**Examination.**—Right thigh is found flexed; slight rigidity of the right rectus and flank muscles; a painful point on pressure midway between anterior superior spine of ilium and navel (McBurney's point indicates the base of the appendix); swelling is indistinct, while the disease is limited to the appendix; later it may become well marked; fluctua-

tion is seldom determined. In a progressing inflammation a blood-count shows an increase in the number of leukocytes.

**Complications and Sequelæ.**—*Obliterating Appendix.*—Appendicitis obliterans begins with stricture formation at any point; appendix may be transformed into a fibrous cord, resulting in cure (Fig. 314).

*Recurrent Appendicitis.*—A general proneness to repeated attacks after once affected.

*Chronic Relapsing Appendicitis.*—Characterized by a low grade of infection during the intervals between frequent attacks, owing to the nidus of pus retained in the appendix.

*General Peritonitis.*—By extension; perforation.

*Abscess.*—Pointing externally in ileocecal region; flank; ischiorectal space; into the gut, discharging through the rectum; into peritoneal cavity, bladder, vagina.



FIG. 314.—Appendicitis obliterans; cicatricial stenosis on distal side (Senn).

**Treatment.**—Rest; restricted diet; gastric lavage; salines; enemata; ice-bag; hot fomentations; mustard plaster (contraindicated when disease is well marked, danger of perforation). Early operation—(a) For increasing tenderness and induration; (b) constant or rising temperature; (c) continued vomiting; (d) obstinate constipation; (e) increasing abdominal tympany. Interval operation may be performed after one attack, must be performed after the second attack (recurrent attack). Dr. Pepper's plan of treatment requires absolute rest in bed (bed-clothes to be supported by a frame), almost complete, if not absolute, withdrawal of food—no food and but little liquid secures cessation of pain and vomiting. He has kept robust young people fourteen days and nights without food. A little opium is given to avoid appetite and to stop tissue waste, not continuously or enough to mask the symptoms. Local: Crushed ice (poultices or



ice-bag), leeching. Don't force movements of the bowels; you cannot remove appendix irritation or drain off inflammatory serum from the vermiform by purgation. Forced movements may cause more irritation than the retained matters did. After a while may use magnesium or sodium sulphate in small continued doses (Dr. Pepper has let twelve days go by before purgation, when improvement continued and the condition seemed not to need it). Employ expectant treatment for the first twenty-four or thirty-six hours. Have a surgical consultation after thirty-six hours. Operate after forty-eight or sixty hours. The time varies, and you must carefully weigh the question. Do not be led too much by the surgeon. Cases which need operation need it as quickly as possible. Spreading cases (perforating or perforated) require instant operation: it is the only hope for life.

That case in which the general symptoms, like vomiting and fever, improve, but the local symptoms do not (abscess formation and working toward the surface), treat expectantly. When operated upon, these cases always do well. Operation must always be considered from the social standpoint (operation would become necessary in an individual who lived far from prompt medical care).

**Operation.**—Appendectomy.

**Appendectomy.**—*Definition.*—Removal of the appendix.

*Implements.*—Scalpel, scissors, dissecting forceps, hemostats (8), retractors (dull and sharp-pointed), needles, aspirating needle.

*Method.*—Prepare the surface as for an aseptic operation; general anesthesia; incision (2–3 inches—5–7.5 cm.—long) over the outer border of the rectus muscle; incise the skin and subcutaneous cellular tissue; divide the muscles by separating them in the direction of their fibers (McBurney's gridiron method); retract; locate the appendix (use the longitudinal fibrous band of the cecum as a guide); dissect a cuff of peritoneum from around the base of the appendix; ligate and resect the appendix; close the cuff over the stump by Czerny-Lembert sutures; replace the cecum; close the abdominal wound.



*Dressing.*—Gauze, cotton, adhesive straps, bandage.

If perforation has occurred—(a) Irrigate the abdominal cavity with hot sterile water, normal salt or boric-acid solution; (b) mop dry with gauze or pads; remove the appendix; drainage: (a) Gauze, rubber-tissue twist, gauze rolled

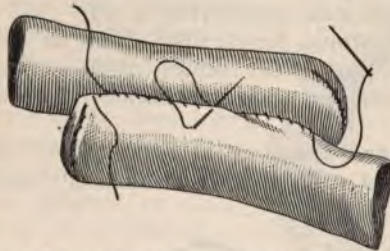


FIG. 315.—Suturing intestines in apposition before incision (Abbe).

in rubber tissue (Mikulicz's drain); (b) drain through posterior culdesac (females); (c) close the external wound, elevate the head of the bed 12 to 18 inches (30 to 45 cm.), sling the patient by shoulders (Fowler's gravity drainage).

**Abscess.**—Open by curved incision through the skin and cellular tissue, extending upward from a little above

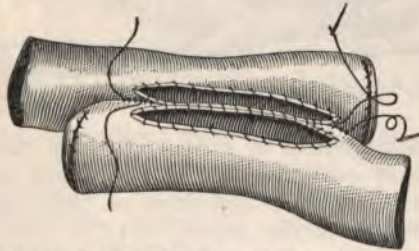


FIG. 316.—Showing the four-inch incision and the sewing of the edges (Abbe).

the middle of Poupart's ligament; locate pus by means of an aspirating needle; open the abscess cavity; irrigate; remove the appendix if it is within reach, or drain.

**Prognosis.**—Favorable for early operation in acute attacks and for interval operations; guarded when complicated.

**New Growths.**—Sarcoma is commonly found above the ileocecal valve; carcinoma, below (Figs. 315, 316).

**Treatment.**—Excision when an early diagnosis can be made; palliative operation; exploratory incision.

**Prognosis.**—Unfavorable.

**Ascites (Dropsy).**—**Definition.**—Accumulation of serous fluid in the peritoneal cavity (Fig. 317).

**Etiology.**—Chronic heart, lung, liver, or kidney disease; pressure upon portal vein (tumor, displaced organ); chronic peritonitis; pressure upon the thoracic duct causes chylous ascites.

**Symptoms and Diagnosis.**—Distention of the abdomen; sense of weight; dyspnea; constipation; movable dullness

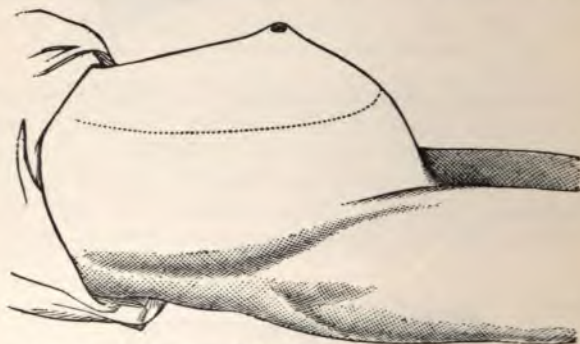


FIG. 317.—Lateral view of abdomen affected with ascites (Albert).

(Fig. 318); enlargement of superficial veins (marked about the navel, *caput medusæ*); bulging of flanks when recumbent in dorsal position; aspiration of clear, straw-colored fluid, albuminous, specific gravity 1012 to 1020.

**Treatment.**—Milk diet, salines, diuretics, diaphoretics; tapping. Hay's treatment consists in the free administration of Epsom salts (with enough water to dissolve) and dry diet.

**Operation.**—Paracentesis abdominalis. Tap early to avoid distention and pressure-symptoms.

**Paracentesis Abdominalis (Tapping).**—**Implements.**—Trocár

and cannula, probe, scalpel, dissecting forceps, hemostats (4), needles, binder (four-tailed bandage).

*Method.*—Empty the bladder; local anesthesia; prepare the skin as for an aseptic operation; apply a binder, have assistant make firm compression from the rear (prevents collapse, hemorrhages, tympanites in a paralyzed bowel); make incision through the skin in linea alba (median line), one or two inches below the navel; thrust trocar and cannula for estimated distance or until sense of loss of resistance is felt; withdraw the fluid slowly (one-half or two-thirds); seal the wound with collodion or by suture. The entrance of air into the chest (through a tap wound) is irritating; air entering the abdominal cavity is not so.

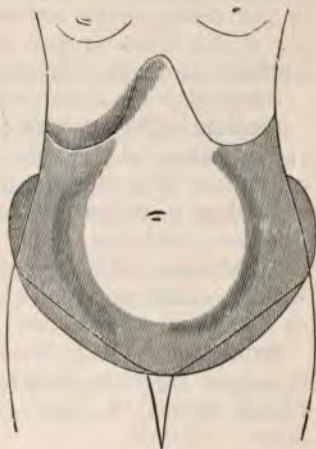


FIG. 318.—Area of dulness (shaded) in ascites (Barnes).

## RECTUM AND COLON.

**Proctitis (Rectitis; Catarrh of the Rectum; Membranous Coloproctitis).**—*Definition.*—Inflammation of the rectum.

**Etiology.**—Extension from enteritis; traumatism (fecal impaction, foreign bodies, parasites); sexual perversion (rectal intercourse); infection (gonorrhea, syphilis, tuberculosis, diphtheria, erysipelas, cholera); drugs (mercury, arsenic, drastic purgatives).

**Pathology.**—Mucous membrane red, swollen, covered with mucus; ulceration; hemorrhages; false membrane; sloughing, with discharge (mucus, serum, blood, pus).

**Symptoms.**—Tenesmus, with discharge of blood, pus, mucus, serum, fever.

**Treatment.**—Enforced rest; restricted diet; ice supposi-



tories; hot or cold rectal irrigations; injection of olive oil, infusion of flaxseed, laudanum and starch-water; dilatation of sphincter. Bismuth subnitrate, sodium carbonate; injection of potassium permanganate (1:3000), carbolic acid ( $\frac{1}{2}$  per cent.), silver nitrate ( $\frac{1}{2}$  to 1 per cent.), boric acid (3 per cent.), alum (1 per cent.), zinc sulphate (1 per cent.), ichthyol (1 to 2 per cent.).

**Prognosis.**—Guardedly favorable.

**Colitis (Dysentery; Bloody Flux).**—**Definition.**—Inflammation of the colon, giving rise to tenesmus and the passage of frequent, small, mucous and bloody stools.

**Etiology.**—Infection (*Amœba coli*); hot weather; bad hygiene; cachexia.

**Pathology.**—Mucous membrane red, swollen, ulceration with hemorrhages, false membrane, sloughing, thickening or cicatricial contraction.

**Symptoms.**—Colic, tenderness over the colon; tenesmus (constant desire to stool); stools are small, contain mucus, blood, shreds of false membrane, sloughs, *Amœba coli*; fever; collapse.

**Complications.**—Abscess of the liver; peritonitis (by extension, perforation); stricture; paralysis of the bowel.

**Treatment.**—*Acute.*—Enforced rest; bed-pan; liquid diet; hot fomentations; mustard plasters; leeching; ice suppositories. Castor oil (early in attack); bismuth subnitrate; salol; quinin; ipecac (when liver symptoms are marked); turpentine.

*Chronic.*—Bowel irrigation with injection of silver nitrate solution ( $\frac{1}{2}$  to 1 per cent.), lead acetate, boric acid. Six ounces (192 c.c.) of tar rubbed up with 8 fluidounces (256 c.c.) of lime-water; percolate through wild-cherry bark, 1 ounce (32 gm.) to 1 pint (512 c.c.). Dose: a wineglassful between meals.

**Prognosis.**—Guarded.

**Constipation.**—**Definition.**—Unnatural retention of fecal matter.

**Etiology.**—Debility; sedentary habits; drugs (lead, opium, after-effects of drastic purges); concentrated food; stricture.

**Treatment.**—Regularity; diet (a variety of foods is a natural purgative); fruit is harmful if it is not well digested; water; enema (soapsuds, olive oil, glycerin); suppositories (glycerin, gluten). Olive oil,  $\text{f}\bar{\text{z}}\text{ij}$  (64 c.c.) t. i. d.; cascara sagrada; rhubarb.

**Prognosis.**—Guardedly favorable.

**Fecal Impaction (Coprostasis).**—**Definition.**—Unnatural accumulation of fecal matter.

**Etiology.**—Middle age; sedentary life; constipated habit.

**Symptoms and Diagnosis.**—Pain; distention; constipation or diarrhea from irritation; acute obstruction with vomiting. Examination reveals doughy tumor at flexure of colon or in rectum.

**Treatment.**—Enema; kneading massage; irrigation (high); injection of oxgall; scoop; forceps; olive oil  $\text{f}\bar{\text{z}}\text{ij}$  (64 c.c.) twice daily.

**Prognosis.**—Favorable.

**Foreign Bodies.**—**Treatment.**—Remove with fingers; forceps; irrigation; stretch sphincter under general anesthesia.

**Parasites.**—**Tape-worms.**—*Tænia solium* (pork tape-worm); *Tænia saginata*, *Tænia mediocanellata* (beef tape-worm); *Bothriocephalus latus* (derived from fish); *Tænia echinococcus* (derived from dogs).

**Symptoms.**—Often obscure; dyspepsia; colic; wasting; loss of appetite; reflex nerve symptoms (convulsive seizures). Diagnose by direct examination of the stools.

**Treatment.**—Milk diet for two days; saline purge morning of administration of pumpkin-seeds, 2 to 3 ounces (64–96 c.c.); oil of turpentine,  $\text{f}\bar{\text{z}}\text{j}$  (32 c.c.); oleoresin of male fern,  $\text{f}\bar{\text{z}}\text{j}$ – $\text{ij}$  (4–8 c.c.); pellelerin, gr. v (0.333 gm.); kousso,  $\text{ʒ}\text{iv}$  (16 gm.); follow with a purgative after two or three hours.

Chloroform has been successfully employed:

R. Chloroform . . . . .  $\text{f}\bar{\text{z}}\text{j}$  (4 c.c.).  
 Syrup . . . . .  $\text{f}\bar{\text{z}}\text{j}$  (32 c.c.).  
 Aq. . . . . q. s. ad  $\text{f}\bar{\text{z}}\text{iv}$  (128 c.c.).

M. Sig.—Divide into four doses, taking one portion at intervals of one hour. Between the third and the fourth dose administer 1 ounce (32 c.c.) of castor oil.



*Prognosis*.—Favorable if the head of the worm is passed.

**Ascaris Lumbricoides (Round Worm)**.—Diagnosed by examination of the stools.

*Treatment*.—Santonin, gr.  $\frac{1}{4}$ – $\text{ij}$  (0.016–0.199 gm.); worm-seed oil, 10 drops (0.666 c.c.); fluid extract of spigelia  $\text{f}\text{3j}$ – $\text{ij}$  (4–12 c.c.).

**Oxyuris Vermicularis (Seat-worm; Pin-worm)**.—*Symptoms*.—Pruritus.

*Treatment*.—Rectal irrigation, followed by injection of 2 to 4 ounces (64 to 128 c.c.) of infusion of quassia chips ( $\text{3j}$ – $\text{iv}$  to pint—8–16 gm. to 512 c.c.).

**Trichina Spiralis (Measle of Pork)**.—*Symptoms*.—Pain; nausea; vomiting; diarrhea; pain and tenderness in the muscles (neck, diaphragm); high fever; sweating; edema.

*Treatment*.—Purgatives; stimulants. Locally, hot fomentations.

*Prognosis*.—Guarded.

**Hookworm Disease (Uncinariasis; Miner's Anemia)**.—*Definition*.—A parasitic disease found chiefly in the Southern States and in the mining regions, caused by the hookworm (*Uncinaria Americana*).

*Morphology*.—The adult worms are about half an inch (1.25 cm.) long; they live in the small intestine of man, where they suck blood, produce minute hemorrhages, and in all probability produce a systemic poison. They lay eggs which cannot be developed in the host, but are passed off in the feces. Maturity takes place in twenty-four hours; the young worm sheds its skin twice, and is then ready to infect man. Entrance to the human body is gained through food-products or by the hands soiled with feces. The larvæ may penetrate the skin and so reach the intestine of the host. These worms are somewhat similar to the hookworm of the old world—Egypt (*Anchylostoma duodenale* gives rise to Egyptian chlorosis).

*Pathology*.—(A) Period of incubation lasting four to ten weeks before eggs begin to appear in the feces. (B) First stage in mild cases giving rise to local symptoms. (C) Stage of simple anemia. (D) Dropsical stage, corresponding to severe cases.



*Diagnosis* is made by finding the eggs in suspected feces, or if a small specimen is placed on blotting-paper, a blood-red stain will be noted.

*Treatment*.—Thymol or male fern, calomel (?), iron, good food, improve the hygiene, change of locality.

*Prognosis*.—Guardedly favorable.

**Hemorrhoids (Piles).**—**Definition**.—Tumors made up of dilated hemorrhoidal veins or capillaries, surrounded by infiltrated connective tissue. May be: (a) External—(1) thrombotic (venous); (2) cutaneous (hypertrophied skin and subcutaneous connective tissue). (b) Internal—bleeding: (1) venous; (2) capillary.

**Etiology**.—Predisposing cause, absence of valves in hemorrhoidal veins; erect posture; heredity. Active causes, constipation, pregnancy, tumor.

**Symptoms and Diagnosis**.—Pain; tenderness; itchiness and sensation of fulness about the anus; bleeding at stool; by examination internal piles may be made manifest by having the patient strain over a vessel containing boiling water.

**Treatment**.—Relieve constipation; suppositories of belladonna and opium for pain; ice; hot fomentations; unguent. gallæ comp.; injection of carbolic acid (20 to 100 per cent.) indicated for small piles high up in the rectum; incision (turn out the clot, packing, under cocain anesthesia); excision, complete removal, suture the cleft, cocain anesthesia; ligation; clamp and cautery; dissection of pile-bearing area (Whitehead operation). Ligation.

**Ligation**.—*Implements*.—Scalpel, scissors, dissecting forceps, vulsellum forceps, needle-holder, hemostats (6), tenaculum.

*Preparation*.—Purgation day before; irrigation of bowel just before operation.

*Method*.—General anesthesia; patient in lithotomy position; stretch the sphincters; draw down each pile; incise skin or mucous-membrane surface about the base; ligate direct or by transfixion with double ligature; replace. Operate by clamp and cautery.

**Operation**.—*Implements*.—Clamp (Fig. 319) and cautery;

scissors; vulsellum forceps; dissecting forceps; hemostats (6); tenaculum; needles.

*Method.*—General anesthesia; patient in lithotomy position; stretch sphincters (forcible traction with thumbs in rectum); draw down each pile with a vulsellum forceps; apply the cautery clamp (clamp securely to avoid the danger of subsequent hemorrhage); cauterize, or excise and cauterize each pile base.

**Dissection of Pile-bearing Area (Whitehead Operation)** (Fig. 320).—*Implements.*—Scalpel, scissors, dissecting-forceps, vulsellum, hemostats (12); needles.

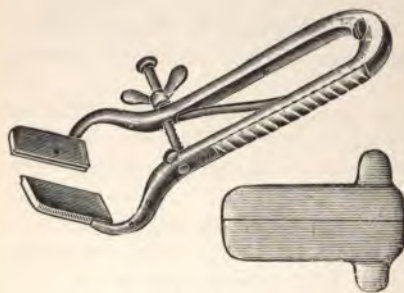


FIG. 319.—Gant's pile clamp.

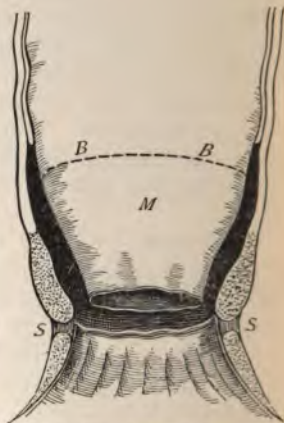


FIG. 320.—S, S, The lower circular incision along Hilton's white line; M, tube of mucous membrane dissected from the sphincter; B, B, dotted line showing the place for the upper circular incision (Edmund Andrews).

*Method.*—General anesthesia; stretch sphincters; dissect mucous lining containing piles from the muscular coat of the bowel; resect and suture the mucous lining above the pile-bearing area to the skin border of the anus.

*Dressing.*—Gauze; tube drain (to allow for the escape of flatus); cotton; bandage; perineal binder.

*Danger.*—Secondary hemorrhage.

*After-treatment.*—Control bowel movement and modify pain for first few days with opium suppositories.

*Prognosis.*—Favorable.

**Fissure (Anal Chaps; Cracks; Painful Ulcer of the Anus).**—*Definition.*—An anal ulcer.

*Etiology.*—Constipation, piles, herpes, eczema, syphilis.

*Symptoms and Diagnosis.*—Painful itching (pruritus ani) due to mucopurulent discharge; spasm of sphincter (sphincterismus); severe pain during and after defecation, with slight bloody discharge. On examination determine the presence of an excoriation or crack; laceration and extrusion of a portion of a semilunar valve appearing as a tender, swollen tubercle (sentinel pile).

*Treatment.*—Treat the cause; mild purgation; silver-nitrate solution, gr. v (0.333 gm.); ichthyol, 30 to 50 per cent.; stretch the sphincter under general anesthesia; incision through the floor of the ulcer.

*Prognosis.*—Favorable.

**Abscess.**—(1) Ischiorectal; (2) marginal.

*Etiology.*—Traumatism; foreign body; exposure; hemorrhoids; tuberculous diathesis.

*Symptoms.*—Pain; redness; swelling; fever; localization with fluctuation and rupture (externally or within the bowel), with subsequent fistula formation.

*Treatment.*—Hot fomentation; cold; early incision; improve hygiene; tonics.

*Prognosis.*—Guarded.

**Fistula in Ano.**—*Definition.*—Sinus formation about the anus.

May be: (a) Complete, having both an external and an internal opening; may encircle the bowel (horseshoe fistula); (b) incomplete (pouched, having but one opening—blind external, blind internal (Fig. 321).

*Etiology.*—Ischiorectal abscess; suppurating hemorrhoid; foreign body; traumatism; stricture of rectum.

*Symptoms.*—Pain; tenderness; pruritus; discharge (mucopurulent, bloody).

*Treatment.*—Treat the cause; stimulation of the edges



with silver nitrate (solid stick); elastic ligature; incision through the fistulous tract.

*Implements.*—Grooved director; probe; scissors; scalpel; dissecting forceps; hemostats (6); tenaculum.

*Method.*—General anesthesia; stretch the sphincters; pass grooved director through fistulous tracts (Fig. 322); incise,



FIG. 321.—Fistula in ano: *a*, Blind external; *b*, blind internal; *c*, complete (Esmarch and Kowalzig).

cutting through the sphincter area; pack with iodoform gauze or swab with pure carbolic acid.

*After-treatment.*—Tonics; improve the hygiene.

*Prognosis.*—Guardedly favorable.

**New Growths.**—Mucoid polypi, condylomata (syphilitic), papillomata, sarcomata (rare), epitheliomata.



FIG. 322.—Operation for fistula in ano (Esmarch and Kowalzig).

**Treatment.**—Early excision; specific treatment when due to syphilis.

**Cancer of the Rectum (Epithelioma).**—**Symptoms and Diagnosis.**—Commences as a small ulcer in the mucous membrane, with induration, or as a nodule extending beneath the mucous layer; growth is persistent; ulceration, fungoid development; infiltration and lymphatic involvement; middle life; male sex; constipation; pain; tenesmus; bloody or mucous discharge; stricture; cachexia.

**Treatment.**—Excision; cauterization.

*Implements.*—Scissors, scalpel, retractors (dull and sharp-pointed), dissecting forceps, hemostats (12), tenaculum, vulsellum forceps, needles, cautery.

*Preparation.*—Purgation for two days before; free irrigation at the time of operation.

**Method.**—General anesthesia; draw down the growth; excise; suture the excavation or cauterize.

**Prognosis.**—Guardedly unfavorable.

**Proctectomy (Kraske's Operation).**—**Implements.**—Scissors, scalpel, dissecting forceps, retractors (dull, sharp-pointed), vulsellum forceps, tenaculum, needles, hemostats (10), cautery, cutting forceps, chisel and mallet, rongeur forceps, saws.

**Method.**—General anesthesia, patient upon left side; median incision from second piece of sacrum to anus; expose rectum by dissecting soft parts and excising coccyx, or chisel

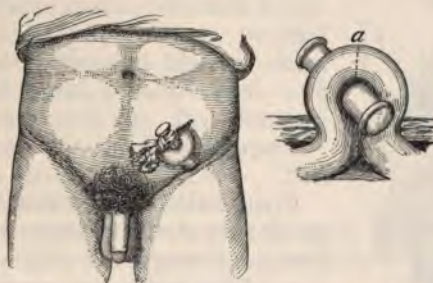


FIG. 323.—Maydl's operation for inguinal colostomy, showing the flanged bar, and at one end the iodoform gauze: *a* is the line of the latter incision (modified from Esmarch and Kowalzig).

away left side of sacrum; remove growth; retention sutures; pack wound. Control hemorrhage by ligature, cautery.

**Dressing.**—Gauze, cotton, bandage (perineal binder).

**Colostomy.**—**Definition.**—The artificial formation of a fecal fistula in the colon.

Required for palliative treatment in cancer of the rectum or sigmoid; congenital malformation.

**Implements.**—Scissors, scalpel, dissecting forceps, hemostats (8), retractors (dull, sharp-pointed), tenaculum, needles.

**Method.**—General anesthesia; prepare the surface as for an aseptic operation; incision (oblique over right or left iliac regions); separate the muscle layers in the direction of their fibers; open the peritoneum; retract; draw the colon for-

wound above the diseased area; incise the mesocolon and pass a glass spoon beneath the colon for retention (Mayo's method) (Fig. 323); suture the two limbs of the colon loop together for support, forming a spur (to prevent fecal matter passing into the lower portion of the bowel); suture the colon to the skin surface. The bowel may be opened at once or after a period of from three to five days, to protect the general peritoneal cavity from infection by leakage.

**Prognosis.**—Good for immediate results.

**Lateral Colostomy (Lumbar Colostomy).—Method.**

—Incision upon the left side (obliquely downward and forward from edge of erector spinae muscle, just below the border of last rib; expose and draw colon forward; suture bowel to skin surface; incise or hold in position for three to four days by two large bandage pins guarded with gauze compresses.



FIG. 324.—Anus ends in a cul-de-sac, the rectum ends in a blind pouch (after Mecklenburg).

**Prognosis.**—Good for immediate result.

**Congenital Malformations (Imperforate Anus; Imperforate Rectum).—Etiology.**

—Failure in involution of the epiblast to meet the end of the alimentary canal (formed from the hypoblast) (Fig. 324).

**Symptoms and Diagnosis.**—Absolute constipation from birth; by examination.

**Treatment.**—Incision; dissection; inguinal colostomy. When the rectum opens into the bladder, urethra, or the vagina, perform an inguinal colostomy.

**Prognosis.**—Guardedly favorable.

**Stricture of the Rectum.**—May be—(a) Simple benign; (b) malignant. In form—(a) Annular (involving less than one inch (2.5 cm.) of bowel); (b) tubular.

**Etiology.**—Cancer, syphilis, tuberculosis, traumatism (post-operative), dysentery, pelvic cellulitis.

**Symptoms.**—Constipation; ribbon-like stools; pain; tenesmus; passage of blood and mucus; formation of ischio-rectal abscess and fistula; cachexia.



**Treatment.**—Simple: Gradual dilatation (rectal bougies); linear incision (proctotomy); treat the diathesis.

**Prognosis.**—Guarded in simple; unfavorable in malignant.

**Prolapse.**—**Definition.**—Protrusion of the bowel. (*a*) Prolapsus ani (protruded mucous membrane); (*b*) prolapsus recti (protrusion of entire thickness of bowel (Fig. 325).

**Etiology.**—Early life; constipation; phimosis; urinary calculi; parasites.

**Symptoms.**—Pain; passage of blood and mucus; projected bowel.

**Treatment.**—Treat the cause; occlusive dressing; cauterization (linear); excision.

**Prognosis.**—Favorable.

**Hernia (Rupture; Enterocoele).**—**Definition.**—Protrusion of any portion of an organ through an abnormal opening in the parietes in which it is normally contained. May be—(*a*) Congenital; (*b*) acquired.

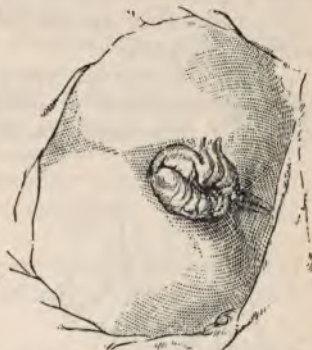


FIG. 325.—Prolapsus of the rectum (after Bryant).



FIG. 326.—Inguinal (scrotal) hernia.



FIG. 327.—Congenital hernia: *T*, Testicle; *F*, *P*, funicular process; *B*, bowel.

**Varieties.**—*Inguinal.*—Commonest form (Fig. 326). (*a*) Direct, internal (inner side of deep epigastric artery), passes

through abdominal wall (Hesselbach's triangle) to the external abdominal ring, and thence to scrotum; (5) oblique, external (to the outer side of the deep epigastric artery), passes through both the internal and the external abdominal rings (inguinal canal) to reach the scrotum.

(A) *Congenital hernia* (hernia into a patulous tunica vaginalis) (Fig. 327).

*Infantile hernia* (cysted hernia, formed by protrusion of covering membrane at upper end of tunica vaginalis, lower portion of tunic being patulous) (Figs. 328, 329).

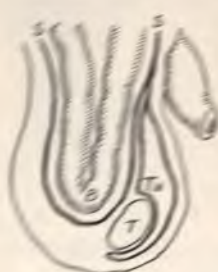


FIG. 328.—Infantile hernia: T, Testicle; T.v., tunica vaginalis; S, S, sac; B, bowel.



FIG. 329.—Encysted infantile hernia: T, Testicle; T.v., tunica vaginalis; (represented as distended); S, S, sac; B, bowel.

*Hernia into the funicular process* (hernia into patulous peritoneal portion of tunica vaginalis, lower end having been obliterated).

*Hernia into the canal of Nuck* (congenital hernia in female children, projection of peritoneum accompanying round ligament).

(B) *Acquired* may be (a) *Oblique*: coverings (sac), skin, superficial fascia, intercolumnar fascia, cremasteric muscle, infundibuliform fascia, subserous areolar fascia, peritoneum. (b) *Direct*: coverings (sac), skin, superficial fascia, intercolumnar fascia, conjoined tendon, transversalis fascia, subserous areolar tissue, peritoneum.

*Diagnosis*.—History (congenital found at birth or occurs soon afterward); acquired, slow development.

*Hydrocele*.—History; pyriform swelling, beginning from below; dull on percussion; no impulse on coughing; translucent; testicle behind.

*Congenital Hydrocele*.—Translucent; impulse on coughing; disappears when patient lies down; slowly reappears from the bottom when in erect position.

*Hydrocele of Cord*.—Tense; fluctuating; translucent; swelling limited to cord.

*Varicocele*.—Dull on compression; feels like a mass of earth-worms; may be reduced by pressure, but refills in spite of firm pressure upon the abdominal rings.

*Hematocoele*.—Sudden appearance after severe traumatism; dull on percussion; no impulse on coughing; doughy feel; opaque by transmitted light.

*Undescended Testicle*.—Absence of testicle in scrotum of affected side; tumor cannot be reduced; no gurgling; sickening pain on compression.

*Etiology*.—Male sex, early life, hard work, constipation, heredity, phimosis, whooping-cough, stricture.

*Symptoms and Diagnosis*.—Swelling; gradual development at one of the abdominal rings; made tense by straining; impulse on coughing; disappears upon lying down or by manipulation (taxis); slips back with a gurgle; no return if finger be held in aperture of ring; tympany on percussion (dull in—(a) Beginning inguinal hernia made up of omental fat or mesentery (bubonocoele); (b) omental hernia (epiplocele)).

*Complications*.—(a) Inflamed hernia (due to traumatism) gives rise to symptoms of local peritonitis. (b) Irreducible hernia (incapable of being put back), due to omental adhesions. (c) Incarcerated hernia (obstruction occurring in an irreducible hernia), manifested by eructation; slight vomiting; constipation; impulse on coughing well marked. (d) Strangulation (constriction at the hernial neck giving rise to obstruction): (a) Passage of feces; (b) circulation.

*Symptoms*.—Faintness, collapse, abdominal pain, tenderness, complete constipation, vomiting (stercoraceous), pain, tenderness, swelling at seat of rupture; absence of impulse on coughing; incapable of reduction.



Strangulated omental hernia (Littre's hernia, partial enterocoele—constriction of omentum and portion of the circumference of intestine) manifested by less marked symptoms of obstruction.

*Treatment.*—Palliative: *Reducible*: well-fitted truss. *Inflamed*: rest, position, ice-bag, opium. *Irreducible*: taxis (attempts at reduction by non-operative means), radical cure. *Incarcerated*: rest, enemata of sweet oil; taxis; castor oil. *Strangulation*: rest, ice, hot fomentations, hot baths (contra-

indicated if gangrene be suspected); herniotomy; abdominal section with lateral anastomosis, enterotomy, enterostomy.

*Operation.*—Herniotomy, kelotomy.

*Implements.*—Blunt bistoury, scalpel, dissecting forceps, grooved director, scissors, hemostats (6), needles, retractors (dull, sharp-pointed).

*Method.*—Local or general anesthesia; prepare surface as for aseptic operation; incision over the most prominent part of the swelling; dissect down to the sac; relieve the constriction with a blunt-pointed bistoury; examine the bowel,

returning it to the abdomen if reaction is progressive (employ hot water to stimulate); close the wound in the soft parts, performing the radical-cure operation; laparotomy may be required subsequently for sloughing, general peritonitis, gangrene of the bowel.

**Radical Cure.**—*Implements.*—Scalpel (2), scissors, dissecting forceps, retractors (dull, sharp-pointed), hemostats (8), needles.

*Method.*—General or local (cocain) anesthesia; prepare

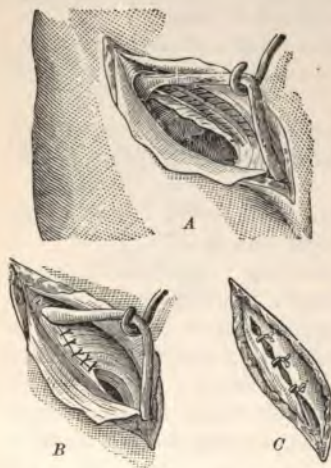


FIG. 330.—Bassini's operation for the cure of inguinal hernia, showing transplantation (a, b, c) of the cord.

the surface as for an aseptic operation; incision over the hernial tumor; dissect down to the sac; reduce the hernia—(1) Bassini's method (Fig. 330): Incise the aponeurosis of the external oblique muscle from the external ring to the internal (opens the canal); isolate the sac; twist the sac;



FIG. 331.



FIG. 332.



FIG. 333.



FIG. 334.



FIG. 335.

FIGS. 331-335.—Macewen's operation for radical cure of inguinal hernia: Fig. 331, Stripping of the sac; Fig. 332, purse-string suture; Fig. 333, fastening the purse-string suture; Fig. 334, passing and tying; Fig. 335, the sutures for the internal ring.

ligate; resect; suture the margins of the rectus, internal oblique, transversalis muscles and transversalis fascia to Poupart's ligament (underneath the retracted cord); suture the divided aponeurosis of the external oblique; suture the skin. (2) Halsted's method: Divide the muscles of the abdominal wall as far as the level of the anterior superior

spine of the ilium; suture the walls of the dissected sac with quilted sutures; resect the lower portion of the sac; transplant the cord to the upper and outer angle of the wound; close the muscles, divide ring and skin by sutures separately. (3) Macewen's method (Figs. 331-336): Isolate the sac, pucker up with sutures, replace within the internal ring; suture conjoined tendon to Poupart's ligament.

*Dressing.*—Gauze, cotton, bandage, plaster-of-Paris dressing.

*After-treatment.*—Two to six weeks' rest in bed.

*Prognosis.*—Favorable if the operation has been aseptic.

**Femoral Hernia (Crural Hernia; Merocele)** (Fig. 337).—**Definition.**—One in which the escaped bowel passes



FIG. 336.—Macewen's operation for radical cure of congenital hernia.

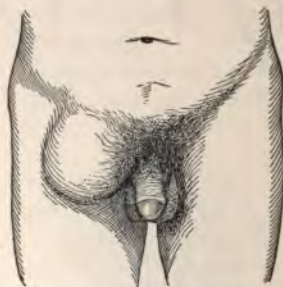


FIG. 337.—Very large femoral hernia.

beneath Poupart's ligament, passes through the femoral ring, and enters the femoral canal.

**Diagnosis.**—Lies to the outer side of the spine of the pubis; it lies inside the vessels. Female sex is affected more often than male (5 to 1).

*Psoas Abscess.*—Lies outside the vessels; history; angular deformity of the spinal column.

*Lipoma or Adenitis.*—Lobulated; no impulse on coughing; irreducible; dull on percussion.

*Varix of Saphenous Vein.*—Refills from below.

*Aneurysm.*—Expansile pulsation; bruit; dull on percussion.



**Treatment.**—Incision with dissection of the soft parts to the sac, coverings (skin, superficial fascia, cribriform fascia, crural sheath, septum crurale, sac); isolate the sac; reduce the hernia; ligate the sac; resect; suture the posterior portion of Poupart's ligament to the pectineal aponeurosis; suture corresponding portions of the falciform ligament to the pectineal fascia; suture the skin.

**Umbilical Hernia (Omphalocele; Exomphalos; Ruptured Navel).**—**Definition.**—Hernia through the navel.

May be: (a) Congenital (protrusion of the sac into the cord); (b) infantile (follows separation of the cord, is due to stretching of the contraction ring); (c) adult (occurs in middle or late life, due to relaxation).

**Treatment.**—Infants: retain by compress, adhesive straps, and bandage. Adult: abdominal support; operation, radical cure.

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (12), retractors (dull and sharp-pointed), needles.

**Method.**—General anesthesia; prepare the surface as for an aseptic operation; median incision; retract the soft parts; isolate the sac; reduce the hernia, open the sac; excise omentum if irreducible; ligate and resect the sac; close the ventral ring by sutures, or dissect before suturing (omphalectomy); suture the skin.

**Dressing.**—Gauze, cotton, adhesive straps; binder or bandage.

**Prognosis.**—Guardedly favorable.

**Ventral Hernia.**—**Definition.**—Hernia occurring directly through the abdominal wall, at the site of a traumatic or operative scar. Gastrocele (stomach), cystocele (bladder), ovaries, gall-bladder, cecum, colon.

**Treatment.**—Binder or abdominal support; radical cure.

**Prognosis.**—Guarded.

**Lumbar Hernia.**—**Definition.**—Hernia occurring in Petit's triangle.

**Treatment.**—Abdominal bandage; radical cure.

**Prognosis.**—Guardedly favorable.

**Perineal Hernia.**—**Definition.**—Hernia into the peri-

neum in front of the rectum; labium of female (pudendal hernia).

**Treatment.**—Pad and T-bandage.

**Prognosis.**—Guardedly favorable.

**Ischiatic Hernia (Sciatic Hernia).**—**Definition.**—Hernia through the great sacrosciatic foramen.

**Treatment.**—Herniotomy.

**Prognosis.**—Guardedly favorable.

**Obturator hernia** is rarely diagnosed.

**Definition.**—Hernia through the obturator foramen.

**Treatment.**—Required when strangulation occurs; herniotomy through the vagina; laparotomy.

**Prognosis.**—Guardedly favorable.

**Diaphragmatic Hernia.**—**Definition.**—Hernia through the diaphragm. May be—(a) Traumatic; (b) congenital (abnormal opening from lack of development).

**Treatment.**—Palliative; suture the diaphragm through an abdominal incision in selected cases.

**Prognosis.**—Guardedly favorable.

**Hernia into Foramen of Winslow.**—**Definition.**—Hernial protrusion through the foramen of Winslow. Recognize when strangulation occurs by exclusion.

**Treatment.**—Laparotomy.

**Prognosis.**—Guardedly favorable.

**Properitoneal Hernia.**—**Definition.**—Hernia occurring between the muscular layers of the abdominal wall.

**Treatment.**—Radical cure.

**Prognosis.**—Guardedly favorable.

**Retroperitoneal Hernia (Mesenteric Hernia).**—**Definition.**—Hernia into the fossa duodenojejunalis.

**Treatment.**—Reduction by abdominal section when recognized.

**Prognosis.**—Guardedly favorable.

**Intestinal Obstruction (Ileus).**—**Etiology.**—(1) *Acute*: (a) Congenital occlusion; (b) intussusception (invagination); (c) strangulation (internal or external); (d) twists (volvulus, knots); (e) paralysis of bowel. (2) *Chronic*: (a) Stricture (contraction of healed ulcer, typhoid, dysentery); (b) fecal impaction (coprostasis); (c) foreign bodies



(something swallowed); (*d*) gall-stones; (*e*) new growths within or without.

**Symptoms.**—Acute, sudden development; chronic, slowly developed; pain (spasmodic at first, later is continuous); constipation; persistent vomiting, fecal (stercoraceous) at the end; frequent urination of moderate amount points to the intestinal obstruction being low down in the bowel; abdominal distention (gas, fluid); collapse.

**Diagnosis.**—Congenital occlusion; common site, anus or rectum; direct examination.

*Intussusception* (invagination of a portion of the gut into a part below, due to reversed peristalsis); common site is ileocecal region; gives rise to sausage-shaped tumor in the direction of the colon; tenesmus; mucous and bloody stools; early life; male sex.

*Strangulation.*—External occurs at umbilical, inguinal, femoral rings in hernia; internal occurs at foramen of Winslow, diaphragm, mesentery, omentum, inflammatory adhesion of intestinal loop. Diagnose by history, local examination, and by exclusion.

*Twist (Volvulus).*—Difficult to diagnose; by exclusion.

*Stricture.*—History of syphilis, tuberculosis, dysentery; ribbon-like stools; examination (rectum a common seat).

*Fecal Impaction.*—Painless, irregular, doughy tumor in the line of the colon.

*Foreign Bodies.*—History; direct examination.

*Gall-stones.*—History; presence of concretions in feces.

*New Growths.*—History; within, cancer (common site at sigmoid flexure of the colon, rectum).

**Treatment.**—*Acute*: Enforced rest; stop food; small doses of opium and atropin to control peristalsis; hot fomentations to abdomen; lavage (large injections of water or air for intussusception after cleaning out the lower bowel by enema); elevate the patient's hips; perform laparotomy if you can exclude intussusception (operate here when in doubt after a reasonable time); compression bandaging with adhesive straps and muslin bandage from the ensiform to the pubis or puncture of intestines for distention may be employed when operative measures are not available.



Treat postoperative bowel obstruction by posture (elevate the hips high); employ a chair-back padded with a pillow; secure an incline of  $45^{\circ}$ ; use abdominal massage; salines; high bowel injection.

**Laparotomy (Abdominal Section for Intestinal Obstruction).—**

*Implements.*—Scalpel, scissors, dissecting forceps, hemostats (8), retractors, (dull, sharp-pointed), vulsellum forceps, needles.

*Method.*—General anesthesia; prepare the surface as for an aseptic operation; incision—(a) median, when obstruction cannot be located; (b) angular, downward and forward across the rectus muscle, between the umbilicus and crest of the ilium (Israel's incision) for cecum or ascending colon (right side), descending colon (left side); open the peritoneum and retract; locate the obstruction; protect extruded intes-



FIG. 338.—Senn's entero-anastomosis: *a*, Senn's bone plate; *b*, intestinal anastomosis; *c*, operation complete.

tine by hot sterile cloths; correct volvulus; release bands of flexion, adhesion, constriction, or invagination, or incise and evacuate (laparo-enterotomy); close the wound or unite the bowel above and below the obstruction (in cicatricial stenosis of inoperable cancer, irreducible volvulus, and invagination if resection is contraindicated by the general or local condition) by intestinal anastomosis; elastic ligature; Murphy button; decalcified bone plates (Fig. 338); suturing (continuous Czerny-Lembert); lateral implantation (union of the end of small bowel to the larger by implanting 1 or 2 inches (2.5–5 cm.) above the closed end of the larger by Lembert sutures (Fig. 339); replace the intestine by elevation of the pelvis (Trendelenburg's position—Fig. 340); suture the abdominal wall from above downward. The Murphy button

may remain attached to the bowel for many months without apparent harm to the patient.

**Enterectomy.**—Required for malignant tumor if completely removable; gangrene.

May be: (a) Partial (must be confined to convex side of bowel to avoid cutting off blood-supply); (b) complete.

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (8), retractors (dull, sharp-pointed), needles.

**Method.**—General anesthesia; prepare the skin surface as for an aseptic operation; open the peritoneal cavity; retract; draw the bowel forward; protect the peritoneal cavity by gauze or pads; apply a double elastic ligature at each end of the section to be removed; ligate the mesentery in sections; unite intestine by—(a) End-to-end suturing (circular enterorrhaphy); (b) Murphy button (Fig. 341); (c) continuous Czerny-Lembert sutures; (d) lateral anastomosis. Omental grafting (suturing a portion of the nearby omentum after scarifying opposing surfaces to the intestine) may be employed to aid in rectifying con-  
fused parts.

**Enterostomy.**—**Definition.**—Formation of a fecal fistula above the ileocecal valve.



FIG. 339.—Lateral implantation.



FIG. 340.—Trendelenburg posture.

**Method.**—General anesthesia; incision 2 or 3 inches (5–7.5 cm.) long, above and parallel to the outer half of Poupart's ligament; open the peritoneum; retract; suture presenting knuckle of gut to sides of abdominal wound; incise the gut, suturing it to the skin surface; irrigate the bowel through the incision.

**Sequelæ.**—(a) Secondary operation for relief of the obstruction; (b) radical operation may be required; (c) permanent fistula.

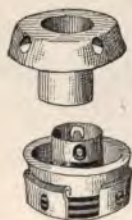


FIG. 341.—Anastomosis button of Murphy.

**Fecal Fistula.**—**Definition.**—A communication between the intestine and body surface; bladder; uterus; vagina.

**Etiology.**—Traumatism; foreign body; gall-stones; abscess; strangulation; perforation; malignant growth.

**Treatment.**—(a) Often closes spontaneously; (b) stimulation of edges with silver nitrate; (c) dissection and suture; (d) destroy the spur by Dupuytren's enterotome; (e) laparotomy, with enterotomy and circular enterorrhaphy or lateral anastomosis; (f) suture of intestinal opening by transverse sutures and dissection of the bowel from abdominal wound after antiseptic precautions; closure of the abdominal wound (spontaneous disappearance of the spur takes place if the bowel is completely released—Senn's method).

## PERITONEUM.

**Peritonitis.**—**Definition.**—Inflammation of the peritoneum.

**Etiology.**—Traumatism; sepsis (pus, gonorrhea); foreign body; perforation (gastric, typhoid, dysenteric, tuberculous, appendicular, syphilitic ulceration); by extension (inflammation of the abdominal viscera).

**Pathology.**—The membrane is dull, red, sticky, followed by exudation (serum, fibrinous, purulent, bloody).

**Symptoms.**—Chill, fever less marked, pain spasmodic, seldom severe, diffuse tenderness, cachexia.

**Diagnosis.**—Great distention; patient lies on his back, with



legs flexed; universal tympany, followed by dulness in the flanks (exudate); anxious expression.

*Typhlitis, cecitis* (inflammation of the cecum) is rare and cannot be distinguished from appendicitis.

*Perityphlitis* (localized peritonitis of the cecum).

**Treatment.**—Liquid diet; hot fomentations; cold; leeching; poultices; opium (relieve pain, check peristalsis); salines (withdraw exudate). If perforation has occurred, diagnose by sudden pain, fall of temperature, distention of abdomen, rapid development of symptoms of peritonitis. Perform immediate laparotomy; locate perforation; suture (enterorrhaphy). In chronic: paracentesis, laparotomy with drainage. Complete the toilet of the peritoneal cavity by—(a) Mopping dry with gauze; (b) flushing freely with normal salt solution (0.7 per cent.); sodii chlorid,  $\pi j$  (4 gm.); sterile water,  $\text{f}\overline{3}\text{xvj}$  (512 c.c.). (c) closing the abdomen or providing drainage (rubber or glass tubing, gauze and rubber-tissue cigarette). Potassium iodid; tonics.

**Prognosis.**—Grave.

### OMENTUM.

**Inflammation** occurs by extension (peritoneum, adjacent viscera); gives rise to adhesions.

**Treatment.**—May be gently broken up by the fingers or by scissors dissection during a laparotomy; cargile membrane (peritoneum taken from the ox) may be employed to prevent recurrence.

**Prognosis.**—Guarded.

**Perforations.**—May be congenital; result of ulceration; traumatism; ruptured visceral adhesions. Give rise to internal strangulation of intestine.

**Treatment.**—Suture after relieving obstruction.

**Prognosis.**—Guarded.

**New Growths.**—Lipoma, sarcoma, carcinoma (secondary), cysts (parasitic, dermoid), angioma, lymphangioma.

**Treatment.**—Removal; prevent hemorrhage by ligating the omentum in sections.

**Prognosis.**—Guarded.

**MESENTERY.**

**New Growths.**—May be lipoma, sarcoma, tuberculous cysts.

**Treatment.**—Seldom possible to remove, owing to danger of interfering with intestinal blood-supply, excepting when cystic (incision and drainage then justified).

**Prognosis.**—Guarded.

**Retroperitoneal Growths.**—May be lipoma, fibroma, sarcoma, tuberculous cysts.

**Diagnosis.**—By exclusion; rectal examination.

**Treatment.**—Exploratory laparotomy; removal if expedient.

**Prognosis.**—Guarded.

**LIVER.**

**Abscess.**—**Etiology.**—Traumatism, foreign bodies, gallstones, retained bile, hydatid cysts, *Amœba coli*, septic emboli. Abscess of the liver is rare in the temperate climates.

**Pathology.**—When due to dysentery, are usually single and occupy the right lobe. Multiple when metastatic.

**Symptoms.**—Hectic; liver enlarged; painful; tender; jaundice; fluctuations; pus is manifested by aspiration (oftentimes may not be detected until the organ has been needled in various directions).

**Treatment.**—Hot fomentations; opium; quinin; stimulants; evacuation and drainage. May be reached by resecting a rib or by an incision parallel to the lower border of the ribs.

**Prognosis.**—Guarded.

**Hydatid Cysts (Echinococcus Cysts).**—**Definition.**—Cystic degeneration in the liver due to presence of echinococcus.

**Diagnosis.**—Long history of swelling; painless; absence of fever; clear fluid by aspiration (containing hooklets).

**Treatment.**—Aspiration; aspiration with injection of carbolic acid, Condy's fluid (a solution made from impure potassium permanganate); excision.

**Implements.**—Scalpel, scissors, grooved director, hemostats (12), retractors (dull and sharp-pointed), probe, vulsellum forceps, needles, aspirating needle.

**Method.**—Prepare the skin surface as for an aseptic operation: general anesthesia; incision over the tumor; retract; open the peritoneum; pack the peritoneal cavity; draw the liver forward; (a) incise the cyst; suture the cyst margins to skin surface (for drainage); (b) allow adhesions between peritoneum and margins of tumor to take place (five to eight days) before incising.

**Dressing.**—Drainage, gauze, cotton, bandage.

**Prognosis.**—Guardedly favorable.

**Rupture of the Liver.**—**Etiology.**—Traumatism.

**Treatment.**—Control hemorrhage by packing or suturing.

**Prognosis.**—Guarded.

**Hepatectomy.**—**Definition.**—Excision of a portion of the liver. Required for traumatism; tumor.

**Method.**—By cutting (hepatotomy); cautery; elastic ligature.

**Prognosis.**—Guarded.

**Floating Liver.**—Due to relaxation of the liver ligaments.

**Treatment.**—Abdominal supports; operation with shortening of ligaments by suturing (hepatorrhaphy).

**Prognosis.**—Guardedly favorable.

## GALL-BLADDER AND DUCTS.

**Biliary Calculi (Cholelithiasis; Gall-stones).**—

**Definition.**—Concretions emanating from the gall-bladder.

**Etiology.**—Female sex; middle life; full habit; sedentary life; tumor; catarrhal hepatitis.

**Pathology.**—Slowing of the bile current, with collection of cholesterin, bile acids, bile-pigments, mucus, lime, and magnesia into one or more concretions. Test a specimen by placing it in a test-tube, adding some chloroform, and gently heating (a gall-stone will be dissolved).

Stones may—(1) Remain latent in gall-bladder; (2) pass out, with or without pain (biliary colic); (3) become im-



pacted; (4) perforate (intestine, stomach, colon, peritoneal cavity); (5) stricture may result from ulceration; (7) intestinal obstruction from impaction.

**Symptoms and Diagnosis.**—Sudden and intense pain over the hepatic region, radiating to right shoulder, with or without fever; jaundice (from obstruction); presence of stones in the stools. Have the patient save all fecal matter, pass it through a fine sieve (dissolve with warm water, straining with a whisk-broom). Examine the urine daily for bile.

**Treatment.**—Hot fomentations; morphin; general anesthesia.

**Prophylaxis.**—Vegetable diet; improve the hygiene; olive oil; sodium phosphate; encourage water-drinking. Operation when symptoms are violent or continued.

**Implements.**—Scalpel, retractors (dull, sharp-pointed), hemostats (8), tenaculum, needles.

**Method.**—Prepare the surface as for an aseptic operation; general anesthesia; incision over tumor or parallel to lower border of ribs; open peritoneum; retract; pack the peritoneal cavity; draw the gall-bladder forward; exploratory incision with removal of stones and drainage (from common duct, choledochotomy), opening the gall-bladder (cholecystotomy), ligation of ducts and excision of gall-bladder (cholecystectomy), union of gall-bladder to intestine by Murphy button or by Lembert sutures (cholecystenterostomy).

**Prognosis.**—Generally favorable.

## PANCREAS.

**Pancreatitis.**—**Definition.**—Inflammation of the pancreas. May be—(a) Acute; (b) acute hemorrhagic; (c) suppurative; (d) chronic; (e) interacinar.

**Morphology.**—*Acute pancreatitis* is essentially a peritonitis of the upper abdomen, accompanied by various lesions in the gland itself. Fat necrosis is a common sequel, with high mortality.

*Acute hemorrhagic pancreatitis* is due to complex changes in the ferments and internal secretion of the pancreas. On-

set is followed by a rapid destruction of the gland parenchyma. Bleeding is first confined to the interlobular connective tissue; later the whole gland may become involved. Progressive inflammatory reaction is present from the beginning, ending in cellular necrosis. Total destruction of the gland substance may take place, leaving but areas of granular debris, gangrene, or abscess.

*Suppurative pancreatitis* is always due to infection, which takes place from the ductus choledochus. The forming abscess is seldom outlined early; may simulate splenic abscess. Jaundice occurs from pressure upon the common bile-duct. Radiography may assist in making the diagnosis. Symptoms of necrosis and gangrene may be manifested by noting the presence of gland fragments in the stools.

*Chronic Pancreatitis.*—Results from—(a) Obstruction of the gland-ducts from biliary or pancreatic calculi, infection (ascending, secondary to chronic gastro-intestinal disease), carcinoma. Chronic pancreatitis is often mistaken for malignant disease, and is similar to like changes in the liver (cirrhosis). The diathesis (alcoholism, tuberculosis, syphilis), causing sclerotic change in the heart, liver, and kidneys, is particularly liable to affect the pancreas. Sclerotic change in the pancreas is manifested by the following: The gland enlarges (especially the head), becomes infiltrated (often a nodular hardness is present on palpation), fatty degeneration may gradually occur, glycosuria occurs, pain (concentric in the epigastrium or radiating upward toward the heart); sudden collapse often occurs and vomiting. Arteriosclerosis is usually associated. Obstruction of the duct of Wirsung by calculi or from stenosis usually takes place.

*Interacinar pancreatitis* is of unknown origin, accompanied by diabetes.

The pancreas may be the seat of cysts (due to calculi (Fig. 342) or contraction of the gland-duct), abscess, malignant growth (carcinoma), calculi (are seldom diagnosed and are composed largely of calcium carbonate). Atrophy of the gland follows interlobular pancreatitis.

**Symptoms.**—General symptoms are fluctuating tumor (hard and nodular at times), pain and tenderness, with mus-

cular resistance, fever, hectic if from purulent infection, fatty stools (steatorrhea), gastro-intestinal disturbance, wasting, hemorrhage, jaundice, glucosuria (not common, but of serious import when present). Crystal changes in the urine are claimed to be of value in differentiating pancreatic disease.

**Treatment.**—Remove the cause when possible; open operation.

**Implements.**—Scalpel, scissors, retractors (dull, sharp-pointed), hemostats (8), dissecting forceps, vulsellum forceps, needles.

**Method.**—Prepare skin surface as for an aseptic operation; general anesthesia; incision over the swelling; open perito-



FIG. 342.—Dilatation of the pancreatic duct and atrophy of the pancreas, due to calculi (Orth).

neum; protect the intestine and surrounding organs by gauze pads to avoid infection. Reach the pancreas—(1) Through the gastrocolic omentum, below the stomach; (2) through the gastrohepatic omentum, above the stomach; (3) through the transverse mesocolon, back of the colon, and stomach. The first route is the best for drainage; it consists in dividing the two layers of the peritoneum (forming gastrocolic omentum), raising the stomach, and then cutting through the ascending layer of the transverse mesocolon. The pancreas is then brought to view and the nature of the lesion determined by the aid of sight and palpation. Hemorrhage must be entirely controlled, for there is little tendency for it to cease spontaneously. The local action of



pancreatic ferments set free by inflammatory reaction and hemorrhage is destructive to visceral tissue. *Treat* hemorrhage during operation by gauze tampon and deep-set sutures; local ferment changes, by providing free drainage; infection, by free incision and drainage. Incise the gland if it is found tense and edematous (reddish or purplish color), and drain; in extensive necrosis provide free drainage (best secured by loin drainage, incision made at the left costo-vertebral angle) after incising the gland; abscess and gangrene, freely incise and provide free drainage (loin). Complete the operation by closing the abdominal wound as far as possible after walling off the disease area (gauze). Gallstones may complicate the pancreatic condition.

Pancreatic cysts should be dissected out entire when possible, otherwise drain. Aspirate only as a last resort (patient very ill with diabetes or from pressure effects), as there is danger of leakage into the peritoneum, for the cyst always refills. When possible, open the abdomen with a median incision above the umbilicus; bring the pancreas and cyst to view through an incision of the gastrocolic omentum or the transverse mesocolon. Withdraw the fluid by aspiration (guard the peritoneal cavity by gauze pads); draw the cyst sac forward and suture to the abdominal wall (drain with a rubber tube and careful packing if the cyst is too small to be so treated); trim away the protruding sac; provide drainage; gauze dressing.

**Prognosis.**—Guarded for all pancreatic conditions.

**Wounds.**—Wounds occurring during operations or from traumatism may be treated by suturing.

**Prognosis.**—Guarded.

### SPLEEN.

**Splenitis.**—**Definition.**—Inflammation of the spleen.

**Morphology.**—*Acute*: Follows the acute infectious fevers, typhoid fever, malaria. *Chronic*: Chronic indurative splenitis ("ague cake," fibroid spleen) is a sclerosis. Leukemic spleen, characterized by a marbled appearance, due to especial enlargement of the lymphoid follicles. Hodgkin's

disease (it is unknown whether the splenic condition is primary or secondary). Amyloid degeneration occurs (similar change in the liver and kidneys) during the progress of chronic suppuration; may be—(a) Circumscribed, affecting the Malpighian bodies (sago spleen); (b) diffuse (a uniform degeneration).

**Splenoptosis (Wandering Spleen).**—The organ may wander to any part of the peritoneal cavity.

**Etiology.**—Females, early middle life, frequent pregnancies.

**Pathology.**—Engorgement, atrophy, or axial rotation may occur; dragging on the stomach (producing dilatation), pressure on the bile-ducts (causing jaundice), forming adhesions to the intestine (intestinal obstruction), by entering the pelvis (gives rise to uterine displacements, prolapse). The patient's life is endangered from the danger of rupture of the stomach or intestine, intestinal obstruction, splenic rupture, or abscess.

**Diagnosis.**—Determine by palpation (a freely movable organ), noting a notch upon its edge, absence of the spleen from its normal position. Always examine the blood to detect the presence of leukemia or malaria.

**Treatment.**—Corset; suturing (splenopexy, anchoring the spleen). Splenectomy (removal of the spleen) may be considered if no leukemia is present.

**Prognosis.**—Guardedly unfavorable.

**Splenectomy.**—**Definition.**—Excision of the spleen.

**Implements.**—Scissors, scalpel, dissecting forceps, hemostats (8), vulsellum forceps, retractors (dull, sharp-pointed), tenaculum, needles.

**Method.**—Prepare surface as for aseptic operation; general anesthesia; incision in left semilunar line; retract soft parts; open and retract peritoneum; ligate adhesions; protect abdominal cavity by packing; draw spleen forward; excise; clamp and ligate vessels; avoid twisting pedicle; drain.

**Dressing.**—Gauze, cotton, bandage.

**Prognosis.**—Guarded.

**Cystic Tumor.**—May be dermoid, hydatid.

**Treatment.**—Incision; drainage.

**Prognosis.**—Guarded.

**Rupture.**—Wounds due to traumatism.

**Treatment.**—Suture; excision.

**Prognosis.**—Guarded.

Both the spleen and pancreas may be the seat of morbid growth. In the spleen may occur the so-called primary cancer (endothelioma), carcinoma (always secondary), sarcoma (generally secondary melanotic).

**Symptoms.**—Pain; rapid wasting; fatty stools; jaundice; glycosuria; presence of immovable, irregular tumor (transmitted pulsation at times).

**Treatment.**—Early, operative; late, palliative.

**Prognosis.**—Unfavorable.

### THYROID GLAND.

**Thyroiditis.**—**Definition.**—Inflammation of the thyroid gland.

**Etiology.**—Infectious fevers, typhoid.

**Symptoms.**—Pain, swelling, fever, vertigo, cyanosis, epistaxis.

**Treatment.**—Hot fomentations; cold; incision.

**Prognosis.**—Guardedly favorable.

**Goiter (Bronchocele; Struma.)**—**Definition.**—Hypertrophy of the thyroid gland.

May be cystic (commonest form), parenchymatous, vascular, amyloid, follicular.

**Etiology.**—Heredity; female sex; true cause unknown.

**Symptoms and Diagnosis.**—Freely moving swelling, painless, tense, elastic, dull on compression, not attached to jaw; rises and falls in the act of swallowing; murmur (vascular variety).

**Treatment.**—Iodin (internally administered); electrolysis; partial excision.

**Thyroidectomy.**—**Implements.**—Scissors, scalpel, dissecting forceps, retractors (sharp, dull), hemostats (12), volsellum forceps, needles.

**Method.**—General anesthesia; prepare surface as for aseptic operation; incision (median); retract soft parts; dissect and enucleate greater portion of gland from capsule; ligate



pedicle; avoid recurrent laryngeal nerves; suture skin surface.

**Dressing.**—Gauze, cotton, bandage.

**Sequelæ.**—Myxedema; cachexia strumipriva; tetany.

**Prognosis.**—Guardedly favorable.

**New Growths.**—Usually malignant (sarcoma, carcinoma).

**Treatment.**—Early enucleation.

**Prognosis.**—Unfavorable.

#### THYMUS GLAND.

**Continuance of thymus gland** with hypertrophy may occur, giving rise to symptoms of compression.

**Treatment.**—Tracheotomy; excision.

**Prognosis.**—Favorable.

## CHAPTER XXII.

### SURGERY OF THE SKIN AND LYMPHATIC SYSTEM.

#### DERMATITIS.

**Definition.**—Inflammation of the skin, the result of an irritant.

**Etiology.**—Traumatism, drugs, heat, cold, vegetable and animal irritants.

**Treatment.**—Remove cause. Locally: Saturated solution boric acid, carbolic acid, 40 drops to 1 pint (512 c.c.) of water (for itching); *grindelia robusta*, ℥ss to Oj (16 to 512 c.c.) of water (when caused by ivy-poisoning). Tinct. iodin; silver nitrate, gr. v (0.333 gm.) to ℥j (4 c.c.) of water for chilblain, after rubbing with ice or snow to restore the circulation.

**Prognosis.**—Good for acute, guarded for chronic, form for cure.

#### CHAFING.

(*Erythema Intertrigo.*)

**Definition.**—Hyperemia due to friction of opposing skin-surfaces.

**Treatment.**—Separate the parts (cotton); boric-acid solution; dusting-powder (talcum, starch).

**Prognosis.**—Good.

#### SEBORRHEA.

(*Steorrhæa.*)

**Definition.**—Functional disorder of sebaceous glands, giving rise to excessive secretion of sebaceous material.

**Morphology.**—(a) *Seborrhœa sicca* (dandruff); (b) *seborrhœa oleosa* (oily discharge occurring about the face).

**Treatment.**—Tonics. Locally: Sulphur, mercury, tar, carbolic, resorcin ointments. Calomel, gr. xx (1.333 gm.) added to 1 ounce (32 gm.) of zinc ointment is useful in facial varieties.

**Prognosis.**—Guardedly favorable for cure.

### COMEDO.

(Black Heads.)

**Definition.**—Retention of discolored sebaceous matter with distention of the ducts.

**Etiology.**—Early life, debility, indigestion, anemia, lack of personal cleanliness.

**Treatment.**—Tonics; soften the skin (hot fomentations) and express the plugs (flesh-worms). Tonics; mercurial and sulphur ointments.

**Prognosis.**—Guardedly favorable for cure.

### MILIUM.

**Definition.**—Retention of sebaceous material with occlusion of the outlets of the ducts.

**Symptoms.**—Appear as small, round, pearly elevations upon the face.

**Treatment.**—Incise and express the contents; stimulate the skin by alcohol; tincture green soap, kneading.

**Prognosis.**—Guardedly favorable for cure.

### PNEUMATOCELE.

**Definition.**—Air tumor of the scalp due to subperi-cranial communication with the mastoid cells.

**Symptoms.**—Painless, elastic, tympanitic, compressible swelling.

**Treatment.**—Compression; aspiration and compression.

**Prognosis.**—Favorable.



## WEN.

(Sebaceous Cyst; Steatoma.)

**Definition.**—An accumulation of sebaceous matter within the skin or subcutaneous cellular tissue.

**Symptoms.**—Slow, painless development of one or more rounded or oval elevations, varying from a pea to a goose-egg in size, of doughy consistence, containing yellowish-white, caseous material. Occurs commonly upon the face, scalp, back, or scrotum.

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (6), retractors (small, sharp-pointed), needles.

**Treatment.**—Local anesthesia; (a) dissection of the sac and contents; (b) divide the tumor in two with one incision, draw out the two hemispheres with the aid of forceps. Simple evacuation of the contents is followed by return.

**Prognosis.**—Good when the sac is entirely removed.

## ACNE.

(Acne Vulgaris; Pimples.)

**Definition.**—An inflammatory disease of sebaceous glands giving rise to papules and pustules, occurring usually upon the face, chest, shoulders.

**Etiology.**—Early life (puberty), gastro-intestinal disorders, drugs (copaiba, iodids, bromids).

**Pathology.**—Result of irritation of retained sebaceous matter; comedones associated.

**Treatment.**—Tonics, diet (nutritious without being rich); improve hygiene. Calx sulphat., gr.  $\frac{1}{10}$ — $\frac{1}{4}$  (0.006–0.016 gm.) four times daily (in the pustular form); arsenic (in the chronic, indurated variety).

**Prognosis.**—Favorable if persistently treated.

## ECZEMA.

(Tetter.)

**Definition.**—A non-inflammatory disease of the skin giving rise to multiform lesions, associated with infiltration, itching, and discharge.

**Etiology.**—Early life and old age, debility, gastro-intestinal disorders, rheumatism, alcohol, external irritants.

**Pathology.**—Congestion and infiltration of the various layers of the skin.

**Treatment.**—Improve hygiene, tonics. Locally: ointments (boric acid, zinc, carbolic, resorcin, tar, mercury).

**Prognosis.**—Guarded, persistent treatment will be required.

### HIVES.

(Urticaria; Nettle-rash.)

**Definition.**—Inflammatory disease of the skin, characterized by the eruption of evanescent wheals associated with intense itching.

**Etiology.**—Gastro-intestinal derangement, emotion, ingestion of shell-fish, tomatoes, strawberries (in susceptible individuals), insect-bites, drugs.

**Pathology.**—Vasomotor spasm followed by paralysis, giving rise to an outpouring of serum.

**Symptoms.**—Sudden, general, evanescent, reappearing eruption of papules and various-sized wheals, associated with intense itching or burning sensations.

**Treatment.**—Remove the cause. Alkalis, salicylates, quinin, iodid of potassium, atropin. Locally, alcohol, carbolic-acid solution (1 : 500), boric acid (saturated).

**Prognosis.**—Good for acute attack; guarded for cure.

### CALLUS.

(Callositas; Keratoma.)

**Definition.**—Hypertrophy of the outer layers of the epidermis from friction or pressure.

**Treatment.**—Remove the cause. Local: soften parts by soaking in hot water. Acid. salicylic., ʒj (4 gm.); collodion, fʒj (32 c.c.). Apply twice daily.

**Prognosis.**—Good.

### CORNU.

(Clavus.)

**Definition.**—Localized hypertrophy of the epidermis due to friction or compression. When macerated by perspiration, soft corn.

**Treatment.**—Remove the cause; soaking, paring; apply adhesive plaster (Fig. 343). Acid. salicylic., gr. xxx



FIG. 343.—For corn on bottom of foot, put on several layers of adhesive plaster.

(2 gm.); ext. cannabis indica, gr. x (0.666 gm.); collodion, f $\overline{3}$ ss (16 c.c.). Apply night and morning.

**Prognosis.**—Good.

### HORN.

(Cornu Cutaneum.)

**Definition.**—Hypertrophic outgrowth from the epidermis.

**Symptoms.**—Appear as dry, rough or horny, more or less conic projections. May be brownish, yellow, gray, or black in color.

**Treatment.**—Excision; cauterize the base.

**Prognosis.**—Good.

### VERRUCA.

(Wart.)

**Definition.**—Circumscribed hypertrophy of papillæ and epidermis.

**Treatment.**—Saturated solution salicylic acid, acetic acid, milkweed, tincture iodine, caustics, excision.

**Prognosis.**—Good.



## HYPERTROPHY OF TOE-NAILS.

Great toe most commonly affected.

Prone to occur in the aged, due to long-continued compression.

**Treatment.**—Excision.

**Prognosis.**—Good.

## INGROWING TOE-NAIL.

Confined almost exclusively to outer side of great toe.

**Etiology.**—Tight, short, or narrow shoes.

**Treatment.**—Packing (cotton forced between nail and inflamed tissue); excision of the overgrowth of the skin and subcutaneous tissue (V-shaped); removal of the nail.

*Implements.*—Hypodermic syringe and needle (cocain anesthesia), scissors, scalpel, hemostats (2), dissecting forceps, retractors (small sharp-pointed).

*Method.*—Carefully cocaine the area about the nail; longitudinal incision through the skin and matrix of nail; retract and dissect out the nail; gauze and bandage.

**Prognosis.**—Favorable.

## ONYCHIA.

(Run-around.)

**Definition.**—Inflammation of the matrix of the nail; may be: (a) Simple; (b) malignant (toe-nail ulcer).

**Treatment.**—(a) **Simple.**—Incision, drainage (through the base of the nail); dress, drain, gauze, bandage, sling or elevation.

*Prognosis.*—Generally favorable.

(b) **Toe-nail Ulcer.**—Avulsion of the nail; caustics—silver nitrate, acid nitrate of mercury, Fowler's solution (internally). Dressing, gauze, bandage, elevation. Constitutional: Tonics, stimulation.

*Prognosis.*—Guarded; persistent treatment is often required.

## KELOID.

(Cheloid of Alibert; Kelis; True Keloid.)

**Definition.**—Hypertrophied scar tissue (Fig. 344).

**Etiology.**—Heredity, race (colored), traumatism (pierced ear-lobes).

**Symptoms.**—Slowly developing overgrowth of scar-tissue; is painful at times.

**Treatment.**—Absorbent plaster (potassium iodid, 3j to 5jss (4–6 gm.); strapping sometimes causes (compression). Caustics, excision (extending well into sound tissue); electrolysis.

**Prognosis.**—Guardedly unfavorable for cure.

## MORPHEA.

(Keloid of Addison; False Keloid.)

Develops without previous scar formation; otherwise is similar to the keloid of Alibert. Occurs upon the sternal region oftentimes.

**Treatment.**—Locally, tincture of iodine, arsenical solution; excision; thyroid extract internally.

**Prognosis.**—Guardedly unfavorable.

## LUPUS.

Occurs as a chronic form of tuberculosis of the skin and subcutaneous tissues.

**Diagnosis.**—Syphilis, history, ulcers deep, distinct, with sharply defined margins; secretion thick, abundant, offensive.

**Treatment.**—Tonics. Locally: scarification, cauterization, curettage, excision, radiotherapy (x-ray, Finsen light, radium).

**Prognosis.**—Guarded.



FIG. 344.—Multiple keloid in a colored woman (after Taylor).

**RODENT ULCER.**

(Jacob's Ulcer; Epithelioma.)

Occurs most often upon the eyelids, cheek, upper lip, nose, or scalp. Beginning late in life from a mole or cutaneous tubercle; is commonly single, round or irregular in outline, indurated; growth indolent but progressive.

**Treatment.**—Excision, cauterization, radiotherapy.

**Prognosis.**—Guardedly unfavorable.

**MALIGNANT DISEASE.**

Skin cancer may be: (A) Carcinoma: (*a*) Lenticular, scirrhous (slow growth); (*b*) tuberous (warty); (*c*) melanotic (pigmented). (B) Epithelioma. (C) Sarcoma.

**Morphology.**—**Carcinoma** always starts in the epidermis (within a duct or gland of the skin); grows and infiltrates the surrounding connective tissue, and forms ulcers. **Epithelioma** is progressive, commencing as papules, later forms tubercles with ulceration (after from two to five years), giving rise to crusts and scabs with some suppuration; the margins are firm and hard.

*Diagnosis.*—Syphilis, history, marked suppuration.

*Treatment.*—Extirpation, knife, curet, or caustic (pyrogallo, 50 per cent.); arsenious acid, 50 per cent. Apply the pyrogallo in a starch paste or as an ointment (application is not painful) spread on for a period of two to three weeks. Arsenious acid is painful and causes edema.

*Prognosis.*—Guardedly unfavorable.

**Sarcoma** (rare in the skin) gives rise to a proliferation of the connective tissue. Tumors are formed, from a pea to a walnut in size; growth is progressive, with ulceration and general loss of bodily strength. Some cases of sarcoma seem to be on the borderland between malignancy and non-malignancy.

*Diagnosis.*—Fibroma, slower course of growth. In all doubtful tumors cut a piece out and examine microscopically.

*Treatment.*—Arsenious acid, 50 per cent.; thyroid extract.

*Prognosis.*—Fatal.



**Granuloma Fungoidia.**—A systemic disease somewhat like sarcoma, gives rise to fungoid growths over wide surfaces, as the face. The tumorous formations resemble skinned tomatoes.

*Treatment.*—Excision.

*Prognosis.*—The disease is fatal in about two years.

## PLASTIC SURGERY.

### SUTURES.

1. **Interrupted** (Fig. 345).—Needle carried through the lips of the wound, one-quarter to one-half of an inch from edges. The suture is then tied in a double knot and the ends cut; wound edges approximated without tension, to avoid stitch abscess. Three or four stitches to the inch are commonly employed.

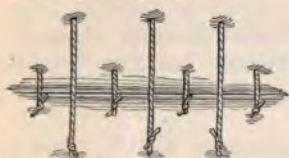


FIG. 345.—Tension and interrupted sutures.

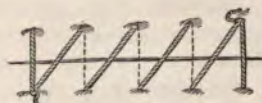


FIG. 346.—Continuous suture.

2. **Continuous (Glover's)** (Fig. 346).—Lips approximated without tension by passing the threaded needle through the lips of the wound from one end to the other,

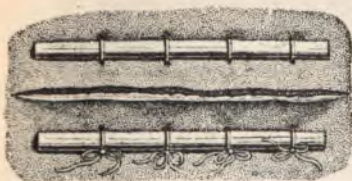


FIG. 347.—Quilled suture (Bernard and Huette).



FIG. 348.—The twisted suture.

at a distance of one-quarter to one-half an inch from its edges. The suture is tied at the beginning and end by doubling.

3. **Quilled** (Fig. 347).—Consists of a double-threaded needle introduced as for interrupted sutures, having a quill passed through the loops before tying.

*Use.*—About the face and where there is great tension.

4. **Twisted (Harelip)** (Fig. 348).—Figure-of-eight turns



FIG. 349.—Button suture.

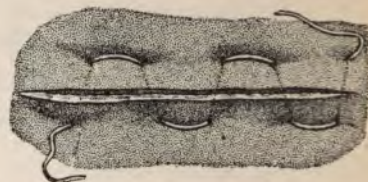


FIG. 350.—The quilted suture (Bernard and Huet).—

of silk thread about pins inserted through the lips of the wound.

*Use.*—Where accurate approximation is desired.

5. **Button** (Fig. 349).—Two lead or bone buttons held by means of silk or silver wire.

*Use.*—As a relaxation suture.

6. **Quilted** (Fig. 350).—A continuous suture employed, supporting approximated wounds; made by reëntering the

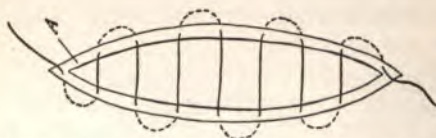


FIG. 351.—Halsted's subcuticular suture: A, is the true skin.



FIG. 352.—Metal suturing clamps.

needle after projection through the lip of one side of the wound before entering the other.

7. **Subcutaneous; Buried** (Fig. 351).—Continuous sutures of subcutaneous tissues. In the skin it consists of a quilted suture passed longitudinally without puncturing the epidermis, to avoid infection.

8. **Purse-string.**—Consists of a quilted suture drawn taut.

9. **Metal Suturing Clamps** (Fig. 352); **Modified Serrefines.**—Made of softened metal. They have been successfully employed as sutures, being readily applied or detached by a dissecting forceps. Scarring is decreased by their use, and claims for value in intestine sewing have been made.

## PLASTIC OPERATIONS.

Required to correct—(a) Congenital malformation (hare-lip, cleft-palate); (b) deformity after traumatism.

### SKIN-GRAFTING.

**Epidermic Method (Reverdin).**—**Implements.**—Needle, scalpel, scissors or razor.

**Method.**—Render the wound surface aseptic, as for an operation; secure small grafts by excision after elevation of the epidermis upon the point of a needle; transplant.

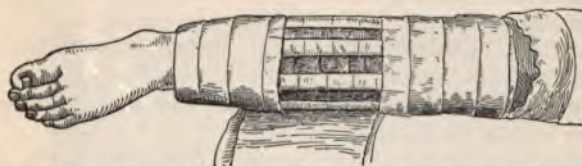


FIG. 353.—Mayer's dressing for Thiersch's method of skin-grafting.

Dressing: protect grafts by overlapping strips of rubber tissue, gauze, bandage.

Scrapings from the soles of the feet or palms, after sterilization by heat and pulverizing with pestle and mortar, may be dusted over the surface of the wound rendered aseptic.

**Thiersch's Method** (Fig. 353).—**Implements.**—Razor.

**Method.**—Render both the area of skin surface selected and the wound aseptic; shave as large a layer of epidermis as possible, having the skin upon the stretch; transplant,



applying smoothly; protect by narrow, overlapping strips of rubber tissue. Dressing: gauze, bandage.

## LYMPHATIC SYSTEM.

**Lymphangitis (Angioleukitis).**—**Definition.**—Inflammation of a lymphatic vessel.

**Morphology.**—(a) Reticular (erysipeloid, general edema of affected area); (b) tubular (isolated, cord-like).

**Etiology.**—Exposure, traumatism, infection.

**Pathology.**—Inflammation may spread from a primary point of infection or by general absorption through the skin.

**Symptoms.**—(a) Reticular, diffuse redness with edema; (b) tubular, streak of vivid red color extending along the course of the vessel; pain, tenderness, fever.

**Diagnosis.**—Phlebitis, dusky-red, knotted to the touch (inflamed valves).

**Treatment.**—Incision and drainage of primary infection; rest, elevation, cold, heat; silver nitrate, gr. xxx (2 gm.) to f3j (32 c.c.) of water; early incision if suppuration threatens. Constitutional, salines, tonics.

**Prognosis.**—Guardedly favorable.

**Adenitis (Lymphadenitis; Bubo).**—**Definition.**—Inflammation of a lymphatic gland.

**Morphology.**—(a) Accompanies lymphangitis; (b) independent by transmitted irritation.

**Etiology.**—Exposure, traumatism (primary bubo, *bubon d'emblée*), syphilis, tuberculosis (Figs. 354, 355), cancer, glanders, plague, gonorrhea, chancroid infection, tropical, malarial.

**Pathology.**—The gland is enlarged, red, juicy, and surrounded by an inflammatory edema. Minute hemorrhages may occur.

**Terminations.**—(a) Resolution; (b) suppuration; (c) fibroid change; (d) cheesy necrosis.

**Symptoms.**—Pain, heat, swelling (oval, nodular, caked), fluctuation, fever.

**Treatment.**—Rest; treat the specific cause; compression, cold, heat. Unguent. hydrargyri, belladonna, ichthyol; in-



FIG. 354.—Cervical adenitis.

jection (carbolic acid, 2 to 5 drops) into the mass; puncture, incision, dissection; facilitate dissection of ruptured glands



FIG. 355.—Same patient shown in Fig. 354; fifth day after operation for removal.

or cystic tumors during operation by stuffing the evacuated sac with gauze or absorbent cotton; markedly movable cervical glands deeply seated about the angles of the lower jaw may be anchored, until they can be brought into view and grasped with a forceps, by outward pressure of a finger from within the mouth or by widely opening the jaws; curettage, drainage; constitutional. A treatment for tuberculous glands of the neck consists of the following course, to be carried out for one month; if not improved, operate at the end of this time:

R. Ichthyol,  
Lanolin . . . . . aa ʒj (32 gm.).  
M. Sig.—Local.

R. Hydrarg. bichlor. . . . . gr.  $\frac{1}{2}$  (0.033 gm.).  
Iodid. arsen. . . . . gr.  $\frac{3}{4}$  (0.052 gm.).  
Iodoform . . . . . gr. x (0.666 gm.).  
Quinin . . . . . gr. lx (4 gm.).  
Syr. of hypophosphite . . . . . fʒiv (128 c.c.).  
M. Sig.—A teaspoonful after each meal.

**Prognosis.**—Favorable in traumatic, gonorrheal, chancroid, syphilitic; unfavorable in cancer, tuberculosis, glanders, plague.

**Lymphangiectasis.**—**Definition.**—General lymphatic enlargement.

**Lymphangioma.**—**Definition.**—A tumor consisting of dilated lymphatic vessels.

**Lymphadenoma.**—**Definition.**—A tumor made up of hyperplasia of lymph glandular tissue; accompanied by enlargement of the spleen, liver, thymus gland, degeneration of bone-marrow, and great increase of white blood-corpuscles (leukemia).

**Elephantiasis (Elephantiasis Arabum; Elephantiasis Pachydermia; Barbadoes Leg; Lymphedema).**—**Definition.**—Hypertrophy of the skin and subcutaneous tissues, associated with lymphangitis, edema, and pigmentation.

**Lymph-scrotum.**—**Definition.**—Elephantiasis of the scrotum.



**Etiology.**—Congenital, heredity, traumatism, parasitic (*Filaria sanguinis hominis*).

**Symptoms.**—Local or general enlargement of the part, with firm edema (lymphedema); rupture of lymphatic vessels gives rise to escape of lymph (lymphorrhagia); chyluria (lymph drainage into the urinary bladder); chylocele (lymph drainage into the tunica vaginalis of the scrotum).

**Treatment.**—Massage, compression, elastic bandage, incision, excision.

**Prognosis.**—Guardedly unfavorable.

**Malignant Lymphoma (Hodgkin's Disease; Pseudoleukemia; Lymphatic Anemia).**—Characterized by hyperplasia, progressive anemia, without increase of white corpuscles.

**Etiology.**—Unknown.

**Treatment.**—Palliative; tonics; supportive; arsenic, increased to full physiologic dose and continued, has been recommended.

**Prognosis.**—Hopeless.

**Lymphosarcoma.**—**Definition.**—Sarcoma of the lymph-glands.

**Treatment.**—Early excision, amputation.

**Prognosis.**—Unfavorable.

#### THORACIC DUCT.

**Rupture of this duct** may follow traumatism (rare).

**Symptoms.**—None well marked until the accumulation of fluid (chyle) gives rise to compression.

**Diagnose** by aspiration.

**Treatment.**—Absolute rest; no food; venous infusion of milk.

**Prognosis.**—Unfavorable.

#### BREAST.

**Mastitis (Mammitis).**—**Definition.**—Inflammation of the breast.

**Etiology.**—(a) Acute; infection during lactation (caked

breast, cracked nipples); exposure; traumatism. (*b*) Chronic: tuberculosis.

**Pathology.**—Inflammation, ending by resolution or suppuration. Pus may be superficial (abscess of the areola); between the lobes (interlobular); within the gland and chest-wall (postmammary).

**Symptoms.**—Stiffness, induration, edema, redness, pain, tenderness, fever, fluctuation.

**Treatment.**—*Acute.*—Rest, elevation, compression (strapping, bandage), breast-pump, suction, hot fomentation, cold; ointments—boric acid, belladonna; incision, drainage. Avoid milk fistulæ by incising in the direction of the nipple.

*Chronic.*—Tonics, stimulation; local, counterirritation, incision, curettage, irrigation, drainage.

**Prognosis.**—Favorable for acute; guarded for chronic.

**Neuralgia.**—Occurs in young unmarried females, usually associated with ovarian disorder.

**Symptoms.**—Hyperesthesia of the breast without any local manifestation of morbid change.

**Treatment.**—Improve hygiene; tonics; moral. Treat any ovarian disorder.

**Prognosis.**—Favorable.

**Tumors.**—Benign may be lipoma, fibroma, myxoma, chondroma, adenoma, angioma, neuroma, adenofibroma (commonest). Cysts: Dermoid, hydatid, galactoceles (milk cyst), glandular, lymphatic (lymph-space cysts), involution (occurring at the menopause).

**Symptoms.**—Firm, elastic, painless swelling; smooth or lobulated; freely movable; slow growth.

**Diagnose** cysts by aspiration.

**Implements.**—Scalpel, scissors, dissecting forceps, retractors (dull and sharp-pointed), hemostats (6), needles, aspirating needle.

**Treatment.**—Tumors: excision, amputation (seldom required). Cysts: incision with drainage; dissection; amputation.

**Prognosis.**—Favorable.

**Malignant.**—May be:

(A) **Sarcoma; adenosarcoma.**—**Diagnosis.**—Female under

forty; breast swelling, heavy, movable, lobulated, distinct capsule, usually single, firm or soft and elastic; at first non-adherent to skin; later, fungous protrusion with fetid bloody or purulent discharge; axillary glands seldom involved; visceral metastasis. Microscopically: Hyperplasia of embryonal connective tissue; cells small, round, giant, spindle.

(B) **Carcinoma.**—(a) Fibrous, hard, scirrhus (fibrous tissue in excess); (b) cellular, soft, medullary, encephaloid; (c) colloid.

**Diagnosis.**—After forty, heavy, stone-hard tumor, movable at first, later adherent to skin and pectoral muscles, skin delicately pitted, pig-skin, reddened, indurated (Paget's disease), papillary degeneration in nipple and areola, retraction of nipple, ulceration, sloughing, lymphatic glands early involved (axillary, mediastinal, pleural), pain (darting, cutting), cachexia, gland involvement, metastasis. Microscopically: Polymorphous epithelial cells. Tumor may shrink (atrophic cancer), become infiltrated with fat (lardaceous); wide-spread superficial development (*en cuirasse*).

**Treatment.**—Palliative in advanced stages; rest, sling, cold, heat, ointments (belladonna, carbolic, boric acid, acetate of lead, gr. x to xv (0.666–1 gm.) to ounce (32 c.c.) of water; plastic operation. Chloral, opium, atropin.

**Operative Treatment.**—Early amputation of the breast, dissection of the lymphatic glands (axillary, supraclavicular), excision of the pectoral muscles.

**Method.**—Implements: Scalpels, dissecting forceps, hemostats (12), retractors (dull and sharp-pointed), needles, infusion apparatus.

General anesthesia; incision wide of the growth, through the skin, cellular tissue, to the muscle fascia; dissect the breast, muscles (pectoral) from ribs and clavicle, reflect; control bleeding by hot water, compression hemostats; dissect axillary and supraclavicular glands; draw flaps together, suture; drainage. Dressing: Arm flexed across the chest, gauze (bichlorid, sterile), cotton, bandage; sling, triangular splint (Figs. 356, 357).

**Prognosis.**—Guardedly unfavorable. Operation usually performed too late to be permanently curative.



**Atrophy.**—May occur in one or both breasts.

**Etiology.**—Congenital, traumatism, ovarian disease (atrophy, oöphorectomy), functional disuse.

**Treatment.**—Tonics, massage, improve hygiene.

**Prognosis.**—Guarded; subsequent pregnancy may restore.

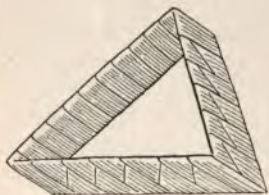


FIG. 356.—Triangular splint for use after breast amputation and fracture of the thigh in children.

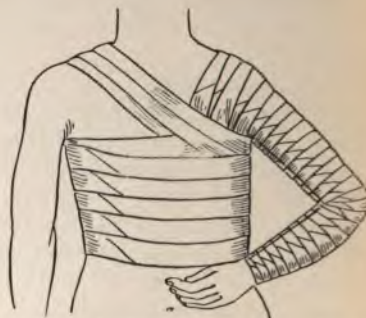


FIG. 357.—Application of triangular splint after removal of the breast.

**Hypertrophy.**—Begins about puberty and is progressive.

**Etiology.**—Obscure; heredity.

**Treatment.**—Compression; treat any uterine or ovarian disease; excision; amputation of one or both breasts.

**Prognosis.**—Guarded; pregnancy has caused contraction.

## NIPPLES.

**Inversion.**—**Definition.**—Retraction due to compression of corsets, congenital defect, mastitis, cancer.

**Treatment.**—Treat the cause; evert nipple by breast-pump, manipulation. Use breast-shield if methods fail in pregnancy.

**Prognosis.**—Guardedly favorable.

**Cracked Nipples.**—Sore nipples due to fissures, infection.

**Treatment.**—Prophylactic; last month of gestation; daily washing; application of sweet oil; saturated solution of

alum (glycerol of tannin and water). Curative: Cleanliness after each nursing; witch-hazel; compound tincture of benzoin; ointment of bismuth subnitrate and castor oil 1 dram (4 gm.) each; silver nitrate, 10 grains (0.666 gm.) to 1 ounce (32 c.c.) of water.

**Prognosis.**—Guardedly favorable.

**Areola.**—Congestion, engorgement, inflammation during the early days of lactation.

**Treatment.**—Saline purgation, compression, hot fomentations, incision.

**Prognosis.**—Guardedly favorable.

**Congenital Malformation.**—Congenital absence of one or both nipples or breasts may occur. Supernumerary nipples and breasts may occur in both sexes.

**Treatment.**—Excision if symptoms arise.

**Prognosis.**—Guarded.

## CHAPTER XXIII.

### SURGERY OF THE GENITO-URINARY SYSTEM.

#### GONORRHEA.

(Specific Urethritis; Blennorrhagia; Tripper; Clap.)

**Definition.**—A virulent, specific, mucopurulent inflammation, affecting the mucous membranes. Commonly occurs in the male urethra; vulvovaginal canal (urethra, commonest); cervix, peri-urethral glands; vagina in female. May affect the eye (purulent ophthalmia), nose, mouth, navel, rectum.

**Etiology.**—Predisposing causes: Excess, alcoholism. Active cause: Gonococcus of Neisser (Fig. 103).

**Pathology.**—Violent inflammatory reaction due to specific organisms; later may be complicated by mixed infection. Gonococci at first grow in superficial epithelium; later penetrate to the deeper cells; may lie dormant during a period of apparent recovery, but capable of setting up a relapse.

**Incubation.**—Four days (may vary from two hours to two weeks).

**Symptoms and Diagnosis.**—(A) **Incubative Stage (Interval Stage).**—A period of from one to three days. Tickling, stinging sensation at the urinary meatus (picotement); drop of viscid, milk-and-water-like fluid, with puffing and redness of the lips of the meatus; warmth or slight scalding upon the first subsequent urination (after the onset of symptoms). Gonococci are found free and in the cells.

(B) **First Stage (Increasing Stage; Acute Stage).**—A period of from five to fourteen days, manifested by frequent urination, scalding (ardor urinæ), painful erections (chordee), profuse purulent discharge; gonococci found free and in cells; fever.



(C) **Second Stage (Stationary Stage).**—A period of from five to fourteen days in which occur profuse discharge, marked ardor urinae, and chordee; numerous gonococci.

(D) **Third Stage (Subsiding Stage; Chronic Stage; Gleet Stage; Blennorrhoea).**—Lasts from one week on. Discharge grows less, becoming watery and scant (morning drop); ardor and chordee disappear; urination may become of normal frequency. Gonococci gradually diminish in numbers or disappear.

**Treatment.**—(A) Hygiene: Rest (no violent exercise); keep the mind free from sexual thoughts (avoidance of females); light, plain diet—milk, buttermilk (avoid fried, greasy, indigestible foods, condiments, alcohol); encourage water-drinking, salines. Order a hot bath at night, patient not to sleep too warm, get up once during the night to urinate (to relieve the bladder); order a suspensory bandage to be worn (Fig. 358).

(B) Discharge: Collect discharge by cotton wisp beneath foreskin; three-inch square of gauze or old muslin incised through the center (pass the glans penis through the perforation to the sulcus behind the corona); gonorrhea bag (foot of stocking containing absorbent cotton, attached to undershirt).

**Abortive Treatment.**—For acute cases seen within first twelve hours after onset—cures in from seven to ten days:

**Method.**—(1) Have the patient urinate; then have him compress the urethra behind the scrotum. By means of a fountain-(bag) syringe, with a 1 : 500 silver-nitrate solution (1 quart—1024 c.c.), wash, with a head-flow of six feet, *in and around* the whole anterior urethra; inject a 5 per cent. silver-nitrate solution into the anterior urethra; retain for three minutes; complete the treatment with a second silver-nitrate (1 : 500) solution; apply a pledget of cotton over the



FIG. 358.—Improved adjustable suspensory bandage (original).

meatus. Keep the patient's bowels open with citrate of potassium, dose, gr. x (0.666 gm.). For a day or two the discharge will be free, bloody, purulent; it then gradually subsides. Examine the discharge daily for gonococci. Use cocain (1 to 2 per cent.) or lead water and laudanum for pain and swelling. (2) Irrigation: Pass nozzle of irrigator to penoscrotal junction. Solution potassium permanganate (1:1000); repeat next day; on third day use solution 1:500. Patient will be cured or require regular treatment thenceforth.

*Internal:* Salol gr. v-x (0.333-0.666 gm.); sodium bicarbonate gr. v-x (0.333-0.666 gm.); three to eight times a day.

R. Salol . . . . . gr. ij (0.133 gm.).  
 Cubebs . . . . . gr. ij (0.133 gm.).  
 Balsam of copaiba . . . . . gr. ij (0.199 gm.).  
 Pepsin . . . . . gr. ss (0.033 gm.).

M. One capsule.

Sig.—Four to sixteen a day.

*Implements.*—Blunt-pointed glass syringe (f3 ij-iv capacity); fountain syringe (2-quart); urethral tips (glass), and guard.

*Local.*—Bathe the penis in water as hot as can be borne; perform a meatotomy if the meatus is small (pinhole meatus); injection of hot sterile water:

R. Acid. boric. . . . . ʒij (8 gm.).  
 Ext. opii aq. . . . . gr. xvij (1.199 gm.).  
 Liq. plumb. subacetat. dil. . . . q. s. ad f3vj (192 c.c.).

M. Sig.—Use as injection two to four times a day (after urination).

R. Hydrarg. chlorid. corros. . . . . gr. ʒi (0.0066 gm.).  
 Zinc. sulphocarbolat. . . . . gr. xvij (1.199 gm.).  
 Boroglycerid (25 per cent.) . . . . . f3ij (64 c.c.).  
 Acid. carbolic. . . . . f3ss (2 c.c.).  
 Aquæ rosæ . . . . . q. s. ad f3vj (192 c.c.).

M. Sig.—Use as an injection two or three times a day after urination. Dilute if painful.

R. Zinc. acetat. . . . . ʒi (4 gm.).  
 Acid. tannic. . . . . ʒj (4 gm.).  
 Acid. boric. . . . . ʒij (12 gm.).  
 Hydrogen dioxid. . . . . f3vj (192 c.c.).

M. Sig.—Injection.

- R. Bismuth subcarb. . . . . ℥ij (8 gm.).  
 Liquid hydrastis (Lloyd's) . . . . . f℥ss (16 c.c.).  
 Boroglycerid. . . . . f℥ij (8 c.c.).  
 Aq. dest. . . . . q. s. ad f℥iv (128 c.c.).
- M. Sig.—Hand injection.

A more astringent injection consists of the following :

- R. Zinc. sulphat. . . . . gr. xij (0.005 gm.).  
 Plumb. subacetat. . . . . gr. xv (1 gm.).  
 Hydrastis (Lloyd's) . . . . . f℥ss (16 c.c.).  
 Aq. dest. . . . . q. s. ad f℥iv (128 c.c.).
- M. Sig.—Use as an injection.

A more astringent injection for later use consists of :

- R. Alum pulv. . . . . gr. xij (0.005 gm.).  
 Zinc. sulph. . . . . gr. xij (0.005 gm.).  
 Aq. dest. . . . . q. s. ad f℥iv (128 c.c.).
- M. Sig.—Use as injection night and morning after urinating.

When the discharge has become mucoid, may employ the following :

- R. Zinc. sulph. . . . . gr. xij (0.005 gm.).  
 Plumb. acetat. . . . . gr. xv (1 gm.).  
 Tinct. opii . . . . . f℥ij (8 c.c.).  
 Tinct. catechu . . . . . f℥ij (8 c.c.).  
 Aq. dest. . . . . q. s. ad f℥iv (128 c.c.).
- M. Sig.—Injection.

For persistence of the gluing of the meatus (morning drop) employ :

- R. Zinc. acetat. . . . . gr. xiv (0.005 gm.).  
 Acid. tannic. . . . . gr. xij (0.005 gm.).  
 Aq. dest. . . . . q. s. ad f℥iv (128 c.c.).
- M. Sig.—Injection. Increase the zinc and tannic acid to gr. xx (1.333 gm.) if no improvement is noted.

Irrigation, once a day, one to four pints (512 c.c. to 2 L.) of hot sterile water; hot permanganate solution (1 : 5000 to 1 : 500); silver-nitrate solution (1 : 10,000 to 1 : 500); bi-chlorid of mercury (1 : 20,000). Formula—4 grains of a drug to 1 pint of water = a 1 : 4000 solution; 5 grains to 1 ounce = a 1 per cent. solution.



An injection which may be used for either an acute or chronic gonorrhea:

- R. Potass. chlorat. . . . . gr. xij (0.799 gm.).  
 Zinc. sulph. . . . . gr. iij-vj (0.199-0.399 gm.).  
 Anilin (to color) . . . . . gtt. ij (0.133 c.c.).  
 Aq. dest. . . . . q. s. ad f $\frac{3}{4}$ ij (96 c.c.).

M. Sig.—Syringe after urination; dilute the injection if painful.

Deep injection silver nitrate ( $\frac{1}{8}$  to 12 per cent.); sounds (begin in stage when a gum forms over the meatus).

**Prognosis.**—Guarded.

**Complications and Sequelæ.**—**Phimosis.**—*Treatment.*—Local baths in water as hot as can be borne; dorsal incision; circumcision.

**Herpes.**—*Treatment.*—Saturated solution of boric acid.

**Balanitis (Balanoposthitis).**—*Treatment.*—Local baths of hot water; cleanliness; hydrogen dioxid (10 to 40 per cent.); calomel dusting-powder; separation of surfaces by thin layer of cotton or gauze (change frequently).

**Ardor Urinæ.**—*Treatment.*—Immerse the penis in vessel of hot water for urination:

- R. Potass. bicarb. . . . .  $\frac{3}{4}$ ss (16 gm.).  
 Spirit. æther. nitr. . . . . f $\frac{3}{4}$ vj (24 c.c.).  
 Tinct. hyoscyam. . . . . f $\frac{3}{4}$ ij (8 c.c.).  
 Liq. potass. citrat. . . . . q. s. ad f $\frac{3}{4}$ vij (256 c.c.).

M. Sig.—One tablespoonful (16 c.c.) every two hours.

**Chordee.**—*Treatment.*—Light bedding; urinate the last thing before going to bed; free purgation; potassium bromid,  $\frac{3}{4}$ ij (12 gm.) added to the above diuretic mixture. Ice-bag; leeching.

**Follicular Abscess (Peri-urethral Abscess).**—*Treatment.*—Hot fomentations; incision.

**Lymphangitis (Adenitis; Gonorrheal Bubo).**—*Treatment.*—Hot fomentation; lead water and laudanum; poultice; incision; pressure (shot-bag, spica, bandage);

- R. Ung. Hydrarg.,  
 Ung. Belladon.,  
 Ung. Ichthyol. . . . . aa  $\frac{3}{4}$ ss (16 gm.).

M. Sig.—Local.

**Cowperitis (Inflammation of Cowper's Glands).**—*Treatment.*—Rest; elevation; leeching; ice-bag; hot fomentations; salines; poultice; incision.

**Prostatitis (Cystitis).**—*Treatment.*—Enforced rest; elevation of the hips; milk, buttermilk, diet; water; flaxseed tea; salol, gr. ij–x (0.1333–0.666 gm.); lithia;

R. Potassium acetat. . . . . ʒiv (16 gm.).

Inf. buchu . . . . . fʒij (96 c.c.).

M. Sig.—One teaspoonful (4 c.c.) four times daily.

leeching; opium suppositories; caution; stop injections.

**Retention of Urine (Acute Prostatitis).**—*Treatment.*—Hot fomentations; salines; enemata; hot hip-baths; catheterism; tapping; external urethrotomy; perineal section.

**Hemorrhage.**—*Treatment.*—Cold; compression (catheter and strapping).

**Perineal (Prostatic) Abscess.**—*Treatment.*—Rest; elevation; cold; hot fomentations; early free incision.

**Epididymitis (Swelled Testicle; Hernia Humoralis).**—*Etiology.*—Extension backward of a gonorrheal inflammation.

*Symptoms.*—Pain (aching, neuralgic, radiating), worse on standing; rapid edema (back of the scrotum) chills and fever; stooping gait.

*Treatment.*—Stop injections; rest; elevation of the scrotum (adhesive strap across the hips, small pillow between thighs, suspensory bandage, to be strapped tightly in position over absorbent cotton while the patient is recumbent); cold; hot fomentations; strapping; puncture the tunica vaginalis (posterior part of the scrotum) for severe pain.

R. Guaiacol,

Olive oil . . . . . aa ʒj (32 gm.).

M. Sig.—Apply locally.

R. Tinct. aconite . . . . . fʒj (32 c.c.).

Tinct. opii . . . . . fʒj (32 c.c.).

Liq. plumb. subacetat. dil. . . . . fʒij (64 c.c.).

Aque . . . . . fʒij (64 c.c.).

M. Sig.—Apply constantly upon gauze or lint.

**Vesiculitis (Seminal Vesiculitis).**—*Diagnosis.*—Increased discharge after a seminal emission.

*Treatment.*—Rest; salines; ice suppositories; strip the vesicles; deep injection of silver nitrate—8 to 10 drops (0.532–0.666 c.c.) of a 1 per cent. solution.

Fuller reaches the seminal vesicles, incising and draining them for chronic affections, also the prostate, by placing the patient belly downward in the Trendelenberg position, with the thighs sharply flexed and spread wide apart. This puts the perineum on the stretch and the vesicles and prostate are reached by open dissection, cutting down between the rectum and the urethra by means of a broad U-shaped incision (Fig. 359).

**Urethral Fever.**—*Treatment.*—Rest; salines; quinin.

**Gonorrheal Rheumatism.**—*Treatment.*—Rest; elevation;



FIG. 359.—The line of incision in Fuller's operation for exposing the seminal vesicles and prostate for purposes of extirpation and drainage.

elastic compression; hot fomentations; diaphoretics; aspiration; incision; irrigation and drainage of joint (ankylosis may result). It is claimed by some surgeons that gonorrheal rheumatism may be dispersed by applying an Esmarch bandage to the affected joint every three or four hours. The application should be continued for a period of from fifteen minutes to one hour. From one to six applications may be necessary.

**Gonorrheal Ophthalmia.**—*Treatment.*—Protect the other eye (Fig. 360); rest; cold; hot fomentations; antiseptic irrigations; nitrate of silver; ointment of yellow oxid of mercury; opium; salines; instillation of atropin.

**Urethral Catarrh (Uorrhoea; Urethral Moisture).**—*Treat-*



*ment.*—Expectant. Over-treatment may be the cause; steel sound (full size) left in position for five minutes once in ten days.

**Chronic Gonorrhea (Chronic Urethritis).**—(a) Anterior; (b) posterior. Determine variety and progress of disease by *two-glass test*. *Method*: Urinate most in first glass, less in second. If first urine is cloudy (pus, shreds, floaters) and last is clear (first urine flushing out the canal) have anterior



FIG. 360.—Application of Buller's shield (de Schweinitz).

urethritis. In acute posterior urethritis both urines are cloudy (pus flows back into the bladder).

*Treatment.*—Injection (useless in posterior urethritis):

1. R. Zinc. acetat. . . . . gr. x (0.666 gm.).  
     Acid. tannic. . . . . gr. x (0.666 gm.).  
     Aq. dest. . . . . ℥iv (128 c.c.).

M. Sig.—Inject night and morning after urinating.

More astringent:

2. R. Bismuth subcarb. . . . . ℥ij (8 gm.).  
     Hydrastis (Lloyd's, colorless, does not stain) . . . . . ℥ss (16 c.c.).  
     Zinc. sulph. . . . . gr. x (0.666 gm.).  
     Aq. dest. . . . . q. s. ad ℥iv (128 c.c.).

M. Sig.—Inject night and morning after urinating.

Administer capsules of cubebs and copaiba, āā gr. v (0.333 gm.), twice daily.

After four or five days commence irrigation (silver nitrate, potassium permanganate, bichlorid of mercury) twice a week, gradually increasing strength of solution; pass a sound after from four to ten days (presence of pus contra-indicates; shreds do not contraindicate); repeat alternately; constitutional; tonics; avoid over-treatment.

Treatment unavailing, begin deep instillation of silver nitrate ( $\frac{1}{8}$  to 12 per cent., 2 to 12 drops—0.133–0.799 gm.) by aid of deep urethral syringe; alternate with sounds every four days to two weeks.

Determine prognosis by—(a) *Beer test.* *Method:* Absence of: all discharge (no morning drop), gonococci after a test period of a week of beer-drinking; without treatment. (b) Scraping the urethra and examining for gonococci. (c) Production of a test urethritis with a strong solution of silver nitrate (2 to 6 per cent.) or bichlorid of mercury (1:2000); examine for gonococci. (d) Urethroscopy.

**Prostatorrhea (Chronic Follicular Prostatitis).**—*Treatment.*—Vegetable diet; salines; ice suppositories; rectal irrigation with cold water; full-sized cold sounds.

R. Potass. bromid. . . . . ʒij (8 gm.).  
 Citrat. of potass. . . . . ʒj (4 gm.).  
 Mist. . . . . ad fʒij (96 c.c.).  
 M. Sig.—One teaspoonful (4 c.c.) three times a day.

**Sexual Neurasthenia.**—*Treatment.*—

R. Strychnin sulph. . . . . gr. (0.033 gm.).  
 Acid phosphoric dil. . . . . fʒ (32 c.c.).  
 Aquæ . . . . . q.s. ad ʒij (96 c.c.).  
 M. Sig.—One teaspoonful (4 c.c.) three times a day.

**Stricture.**—*Treatment.*—Gradual dilatation with sounds and bougies; forcible dilatation (urethral dilator); internal urethrotomy; external urethrotomy; perineal section.

**Gonorrhœa in Females.**—Acute gonorrhœa rarely comes under treatment.

**Urethra.**—In young girls *vulvitis* may accompany gonorrhœa in the urethra; the disease is lighter than in the male.

Determine the presence of gonococci in the pus (the patient must not wash or urinate before examination).

*Symptoms.*—A sense of pressure, with tenderness along the urethra.

*Treatment.*—Light diet; sitz-baths; vulvar washes. Cubebs and copaiba capsules. Do not douche. After one month begin injections (10 to 15 drops (0.666–1.0 gm.) of weak solution of silver nitrate, zinc, or bichlorid of mercury); medicated bougies (iodoform).

Yeast injection (Method): Brewer's yeast diluted with water sufficient to pour easily is injected into the vagina (10 to 50 c.c.), retain for twenty-four hours by cotton, pad or tampon. No douching needed; combat itchiness by injection of soda solution. Yeast keeps fresh three days if placed on ice.

**Vulva.**—*Treatment.*—Frequent cleansing; washes (warm water, silver solution, 1:4000); oiled lint or boric acid dusting-powder to keep labia separated.

**Cervix.**—*Infection* may extend to tubes and ovaries; is difficult or impossible to cure.

*Symptoms.*—Not marked; little or no pain; cervix mucus is yellow or streaked with blood (may not find gonococci, yet woman may infect men).

*Treatment.*—Douches; after from two to four weeks dilate the external os slightly; remove plug of mucus; swab with carbolic acid solutions of varying strengths; begin with a weak solution.

**Peri-urethral Glands.**—Examine the orifices for pus.

*Treatment.*—Vaginal washes; solid stick nitrate of silver; pure carbolic acid.

**Abscess of Bartholin's Glands (Bride's Abscess).**—Fluid contents may be thin and watery or thick and purulent.

*Treatment.*—Hot fomentations; incision.

**Vagina.**—Rarest form. May affect only the lower third or whole vagina (chronic cases). Red granular patches may be found in the vaginal fornices.

*Treatment.*—When very acute: Rest in bed; local external washes (no douches); milk diet. When acute symptoms subside: Salol, copaiba, cubebs; vaginal douches, fol-



lowed by injections silver-nitrate or zinc-sulphate solution. If symptoms persist, make direct applications of silver-nitrate solutions by means of a speculum or a cystoscope; application to vaginal mucosa of methylene-blue (1 per cent. solution).

*Prognosis.*—Guardedly unfavorable.

### CHANCROID.

(Soft Sore; Soft Chancre; Eating Chancre; Simple Chancre; Simple Venereal Ulcer; Chancroid.)

**Definition.**—A surface sore the result of inoculation with the secretion from a similar sore in the same or another individual.

**Etiology.**—Mixed infection.

**Symptoms and Diagnosis.**—No period of incubation; begins as small red point, rapidly converted into one or more papules; pustules; round, oval, irregular-shaped, punched-out ulcers; discharge (abundant, purulent, highly inoculable); little or no induration; pain.

### CHANCRE.

(Syphilis.)

Follows specific inoculation; incubation twenty-one days (ten to sixty days' variation); begins as an erosion, papule, tubercle, pustule; most often solitary; may not suppurate; round or oval shape; shallow; discharge slight; induration (parchment-like; painless).

**Treatment.**—Cleanliness; frequent local baths in water as hot as can be borne; hydrogen-dioxid spray; separation of glans from foreskin at site of infection by thin wisp of cotton or lint (change frequently); calomel dusting-powder; lotio niger (black wash); potassium-permanganate solution (a saturated solution); cauterization (carbolic acid, nitric acid, actual cautery).

**Prognosis.**—Guardedly favorable; healing commonly occurs in from three to ten weeks.

**Complications.—Phagedena (Phagedenic Ulceration).—***Treatment.*—Cauterization; tonics, stimulants.**Serpiginous Ulceration.**—(Creeping Chancroid; Chronic Phagedena).—*Treatment.*—Cauterization; tonics.**Phimosis; Paraphimosis.**—*Treatment.*—Hot fomentations; preputial injection. Solution of carbolic acid in lead water; black wash; copper sulphate (1 : 2000).

R.	Zinc. sulphat. . . . .	gr. xij (0.799 gm.).
	Acid. boric. . . . .	℥j (4 c.c.).
	Hydrogen. dioxid. . . . .	℥ij (64 c.c.).
	Aquæ . . . . .	q. s. ad ℥vj (192 c.c.).

M. Sig.—Local.

Limited incision (dorsal); circumcision with cauterization.

**Balanitis (Balanoposthitis).**—*Treatment.*—Hot fomentations; lead water and laudanum; salines.**Mixed Sore.**—*Treatment.*—Calomel dusting-powder; black wash; mercurial ointment; begin internal antisymphilitic treatment until secondary eruption appears.**Bubo.**—Occurs in one-third of the cases; rarely bilateral.*Diagnosis from Syphilis.*—Follows hard chancre; chain or group of glands involved; bilateral; painless; slow growth; non-inflammatory; skin freely movable; hard induration; rarely suppurative; mercurial treatment hastens absorption.*Treatment.*—Rest; compression; cold; heat; mercurial ointment; injection, under local anesthesia, of 2 to 5 drops (0.133–0.333 c.c.) of carbolic acid into the mass; puncture; incision, drainage; dissection.*Prognosis.*—Guardedly favorable.**CONCEALED TROUBLE.**

Infection accompanied with inability to retract the foreskin.

May be—(a) Balanoposthitis (simple); (b) gonorrhea with balanoposthitis; (c) chancroid with balanoposthitis; (d) chancre with balanoposthitis; (e) gonorrhea, chancroid, and balanoposthitis.

**Treatment.**—First directed toward relief of the phimosis.

## SYPHILIS.

(Lues; Pox.)

**Definition.**—Is an infectious, contagious, inoculable, constitutional disease transmissible by heredity. Begins as a chancre; later is manifested by general lymphatic enlargement; eruptions of the skin; inflammation and infiltration of one or all of the body tissues.

Characteristic lesions are: (a) Hard chancre; (b) mucous patch; (c) gumma. Nodes are new growths.

**Etiology.**—Probably due to S-shaped bacillus of Lustgarten. Disease may be inherited or acquired.

**Pathology.**—(A) **Primary Lesion (Hard Chancre).**—Occurs at point of inoculation (corona of penis common site) two or three weeks after infection; split-pea size of papule; scanty serous discharge; induration, due to coagulation necrosis of intercellular substance of deeper parts, cellular infiltration of capillary vessel-walls; lymphatic enlargement takes place, beginning in nearest glands (indolent buboes).

*Microscopically.*—Find round, epithelioid, sometimes giant-cells.

(B) **Secondary Lesions.**—Last one to three years. (a) Skin eruptions (chiefly inflammatory); (b) mucous patches—condyloma latum (macrated papules): occur as flat, ulcerated swellings, developing chiefly at mucocutaneous junctions (lips, anus, corona, external genitals of female).

*Microscopically.*—Find round-cell infiltration of upper cells of corium; infiltration of cells of rete mucosum, causing separation in the form of a discharge.

(C) **Tertiary Lesion (Gumma).**—Time duration unlimited. Marked tendency to connective-tissue formation; occurs as a rounded tumor, varying in size from a pea to a hen's egg; raised slightly above surface of tissue involved (may be harder or softer); made up of gray or yellowish gummy mass (mucoid degeneration of connective tissue); found in subcutaneous tissue, bones (skull, tibia, sternum), liver, spleen, testicle, brain; rarely in lung, kidney. Has period of formation, softening, ulceration, repair.

*Microscopically.*—Solid (visceral) gummata are rich in



round, epithelioid, sometimes giant-cells; fibrous capsule with trabeculae; central areas of fatty degeneration.

#### HEREDITARY SYPHILIS.

The disease is readily transmitted from parent to fetus. Fetus most often affected by the mother (recent lesions at time of conception increase liability).

A syphilitic father may beget a healthy or a syphilitic child without infecting the mother.

A syphilitic fetus born of a healthy mother does not infect her (Colles' immunity law).

Children of syphilitic parents may be born healthy (Pro-feta's immunity law).

Abortion is common in syphilitic women (due to syphilitic endometritis).

Incubation from ten to sixty days.

**Symptoms and Diagnosis.**—**Primary Syphilis.**—Begins as a solitary (most frequent), reddish-brown papule (rarely pustular, scabbed): (*a*) Superficial chancre (superficial erosion); (*b*) deep chancre (Hunterian chancre). Pain slight or absent; discharge scant, serous; induration laminated, indistinct; parchment-like, well marked; lesion may be self-limited (two to ten weeks); involvement of neighboring lymphatic-gland groups (bilateral), indolent buboes, followed by gradual, general lymphatic glandular enlargement; especially noted in posterior cervical, at bend of elbow, epitrochlears, inguinal.

**Chancroid.**—No incubation; may be multiple; cup-shaped ulcer; painful; occurs most often on glans penis; no tendency to heal; bubo in one-third of cases; most often unilateral. Verify by confrontation (examination of sexual partner).

**Cancer of Lip.**—Most common in male sex; lower lip; middle life; irregular ulcer; slow growth; late induration and gland involvement; burning, lancinating pain; offensive odor; history.

**Herpes Præputialis.**—No period of incubation; begins as group of vesicles (glans, inner layer of foreskin); multiple;

confluent; superficial; no induration; painful; discharge slight; tendency to recur.

**Secondary Syphilis.**—Glandular enlargement continues; cicatrix of chancre; moderate fever; muscular pain (osteocopic); sore throat; alopecia (unrestricted). Eruption appears five to seven weeks after appearance of chancre; is polymorphous; rounded or crescentic; coppery color; symmetric; no pain or itching; early eruptions apt to be scaling (white, dry, superficial). Varieties: (A) Macules: (a) roseola; (b) erythema. (B) Papules: (a) large flat; (b) small flat; (c) papulosquamous. (C) Pustular: (a) acniform; (b) varioliform; (c) rupia (bullous), vegetations (warts). Mucous patches; specific onychia (dry, moist); scars left after eruption are white, glistening, round or stellate, slightly depressed.

**Cancer of the Tongue.**—Male sex; family history of cancer; begins as hard swelling; ulcerates rapidly; surface bleeds readily; painful; generally single; sometimes found upon under surface of tongue; induration follows cancerous ulceration; edges everted; cachexia; offensive discharge.

**Tertiary Syphilis.**—(A) *Tubercles*—(a) Ulcerative; (b) non-ulcerative (dry).

**Lupus Vulgaris.**—Young adults; slow growth; tubercles light colored; infiltration limited; original papule is soft; margins of ulcer soft and everted; slow growth; scant discharge; bones never involved; seldom painful.

(B) *Gumma.*—Tongue; bones (periosteitis—nodes firm, oblong, circumscribed swellings; osteoperiosteitis; rarefying osteitis; rarefying osteomyelitis, osteocopic pain—bone-tiring); brain; testicle (epididymis rarely affected; testicle stony hard, painless); larynx.

**Tubercular Osteitis.**—Have other symptoms of tuberculosis; begins in the medulla of bone; tends toward disorganization (pus); affects articulations; seldom affects skull.

**Cancer of Testicle.**—No history; any age; rapid growth; skin becomes adherent; ulceration (fungoid mass); fistulæ; bleeds readily; attains large size; unilateral; pain (lancinating); tumor soft and fluctuating; offensive discharge; cord and nearby glands involved; metastasis; rapid loss of flesh and strength.



*Hereditary Syphilis.*—History of syphilis in parents (frequent abortions); pemphigoid eruption, especially upon soles of feet and palms; coryza with snuffles; mucous patches; hoarse cry or cough; senility aspect; enlarged liver, spleen, bones; middle-ear disease; notched teeth (Hutchinson's teeth)—affect permanent upper median incisors; iritis; keratitis; depression of nose; stunted growth.

*Treatment.*—Primary lesion: Cleanliness; abstinence from intercourse; hydrogen dioxid; black wash; stimulation with nitrate of silver.

*Indolent Bubo.*—Compression.

*Secondary Lesions.*—Improve the hygiene; tonics; internal specific treatment. Protiodid of mercury, gr.  $\frac{1}{4}$  (0.016 gm.); biniodid of mercury, gr.  $\frac{1}{4}$  (0.016 gm.); hydrarg. cum creta, gr. j (0.066 gm.):

R. Hydrarg. chlor. corros. . . . . gr.  $\frac{1}{18}-\frac{1}{20}$  (0.004–0.003 gm.).  
Tinct. cinchonæ comp. . . . . f5j (4 c.c.).

Sig.—One dose, three times daily after meals.

Mercurial ointment (inunction); volatilization of calomel (3 gm.) by heating over alcohol-lamp (vapor-bath); tannate of mercury, gr. j (0.006 gm.); bichlorid of mercury, gr.  $\frac{1}{8}$  (0.008 gm.) by injection at ten-day intervals; calomel, gr. j–ij (0.006–0.133 gm.), by injection at ten-day intervals.

*Method of Administration.*—Gradually increase the daily dose until beginning salivation (manifested by an increased flow of saliva, tenderness of gums, pain in molar teeth); reduce daily dose one-third to one-half (to obtain standard dose for individual); continue treatment for two years, increasing the dose temporarily for cause.

Avoid irritation of gastro-intestinal tract by varying drugs, employing inunction or injections; combine with opium: Dover's powder, gr. ss (0.033 gm.).

*Eruption.*—Calomel; mercurial ointment, citrine ointment; guarded increase of standard dose of mercurial.

*Mucous Patches.*—Calomel; silver-nitrate solution (10 to 60 per cent.); copper-sulphate solution; cocain, 4 per cent., for pain; guarded increase of internal medication.

*Sore Throat.*—Cleanliness; solution of potassium chlo-



rate (3 to 5 per cent.); silver-nitrate solution (2 to 30 per cent.).

*Ulcers*.—Mercurial ointment; citrine ointment; calomel; nitrate of silver.

*Gummata*.—Compression; mercurial ointment; curettage; stimulation with nitrate of silver.

*Buboes*.—Compression; mercurial ointment; tincture of iodine.

*Alopecia*.—Petroleum; mercurial ointment.

*Warts*.—Nitrate of silver; nitric acid; chromic acid; concentrated potassium-permanganate solution.

After two years add potassium iodid to standard medication (mixed treatment):

R. Hydrarg. biniodid. . . . . gr. iss (0.099 gm.).  
Potass. iodid. . . . .  $\mathfrak{z}$ iss (6 gm.).  
Cinnamon water . . . . . q. s. ad  $\mathfrak{f}\mathfrak{z}$ iv (128 c.c.).

M. Sig.—One teaspoonful three times daily.

R. Hydrarg. iodid. rub. . . . . gr. ij (0.133 gm.).  
Potass. iodid. . . . .  $\mathfrak{z}$ ij (8 gm.).  
Syr. sarsap. comp. . . . .  $\mathfrak{f}\mathfrak{z}$ ij (64 c.c.).  
Aquæ . . . . . q. s. ad  $\mathfrak{f}\mathfrak{z}$ iv (128 c.c.).

M. Sig.—Two teaspoonfuls three times a day, freely diluted.

Continue for six months; treat any reappearance of syphilis by new-dated course of six months. Keep patient under observation one year after ceasing treatment (reappearance of symptoms calls for a six months' course of mixed treatment).

*Tertiary Lesions*.—Mixed treatment; increasing dosage of potassium iodid—gr. xx-c (1.333–6.666 gm.), three or four times daily until controlled; continue with a course treatment of six months, with subsequent observation.

*Hereditary Syphilis*.—Treat the stage encountered; mercury with chalk; mercurial inunction; potassium iodid (from gr. ss–0.033 gm. up) three or four times a day in syrup.

**Prognosis**.—Guardedly favorable in non-alcoholics. Marriage allowable after four years and one-half of continuous treatment and observation.

## PENIS.

### **Congenital Adhesion of Penis and Scrotum.—**

**Treatment.**—Dissection; plastic-flap operation.

**Prognosis.**—Favorable if treated early before puberty.

**Phimosis.**—**Definition.**—Constricted and elongated foreskin (Fig. 361).

**Etiology.**—Congenital venereal contamination; uncleanness; traumatism.

**Pathology.**—Scar-tissue replacement of the elastic cellular meshwork between the two layers of the foreskin, following inflammatory reaction.

**Symptoms.**—Inability to retract or replace (paraphimosis) the foreskin.

**Complications and Sequelæ.**—Adhesions; preputial calculi;



FIG. 361.—Phimosis from gonorrhea (Cullerier).

balanoposthitis; urethritis; cystitis; eczema; herpes; difficult urination; dilatation of bladder, ureters, and pelves of kidneys; impotence; prolapse of rectum; hernia; hemorrhoids; hydrocele; cancer; reflex nervous phenomena; enuresis.

**Treatment.**—Toilet and hygiene of parts at birth (daily forcible retraction); local bathing in water as hot as can be borne; forcible dilatation (dissecting forceps); avoid causing fissures in mucous layers by not dilating more than once in two or three days; incision and excision.

**Method.**—Cocain anesthesia; prepare surface as for aseptic operation; incision with scissors or a curved bistoury upon a grooved director from the orifice to the cervix along

the middorsal region; control hemorrhage with sutures if necessary; circumcision.

*Operation.—Implements.*—Scissors, scalpel, grooved director, curved bistoury, dissecting forceps, hemostats (6), needles, phimosi forceps.

*Method.*—General or local anesthesia; prepare surface as for aseptic operation. Incision—(a) Circular; Draw foreskin forward; apply phimosi forceps (use ink or tincture of iodine line for guide); resect; tear or incise mucous layer; trim mucous layer flaps; suture. (b) Dorsal incision from the orifice to the sulcus behind corona (cervix); trim skin flaps diagonally from dorsum to a point on the raphe



FIG. 362.—Paraphimosis (Cullerier).

opposite the frenum; trim mucous flaps, using top of corona as a guide (one-eighth to one-quarter of an inch—3 to 6 mm.); resect frenum; suture, apply interrupted sutures, frenal site and dorsal first. Control hemorrhage by elastic ligature at root of penis; hemostats; suture; ligation.

*Dressing.*—(a) Roll of gauze held in position by the four cardinal sutures (dorsal, frenal, lateral) left long, and retied over the dressing; (b) narrow cuff of rubber tissue; gauze roll; retained by narrow bandage, adhesive strap.

*Prognosis.*—Favorable.

**Paraphimosis.**—*Definition.*—A condition in which the foreskin is drawn up behind the corona of the glans and cannot be replaced (Fig. 362).



**Etiology.**—Partial phimosis; traumatism.

**Symptoms.**—Pain, swelling, ulceration, sloughing.

**Treatment.**—Bathing in hot water; vaselin with manipulation; pinching the glans between the fingers with traction upon the foreskin; application of compression bandage, adhesive strap to glans; incision (bottom of second furrow); circumcision.

**Prognosis.**—Favorable if treated early.

**Balanitis (Balanoposthitis; External Gonorrhea).**

—**Definition.**—Inflammation of glans (balanitis) and inner layer of foreskin (balanoposthitis).

**Etiology.**—Urethritis, traumatism, chancroid, chancre, herpes, eczema, cancer, calculi (preputial, urinary), phimosis.

**Treatment.**—Cleanliness; hot fomentations; cold; preputial washes; calomel dusting-powder; separation of glans from preputial surfaces by thin cotton wisp or lint; incision; circumcision.

**Prognosis.**—Favorable.

**Inflammation of the Body of the Penis.—Etiology.**

—Traumatism; urethritis; chancroid; phagedenic mixed chancre; cancer.

**Symptoms.**—Redness, heat, swelling, ardor urinæ, chordee, fever.

**Treatment.**—Diuretics (water, milk, demulcent drinks); cold; hot fomentations; lead water and laudanum; incision.

**Prognosis.**—Guardedly favorable except for cancer.

**Gangrene of the Penis.—Etiology.**—Paraphimosis; traumatism; thrombosis.

**Treatment.**—Hot fomentations; incisions; drainage; amputation.

**Prognosis.**—Guarded.

**New Growths.—Epithelioma (Cancer of the Penis).**—Begins in foreskin or upon body of penis behind glans.

**Etiology.**—Predisposing causes: phimosis; preputial calculi; irritation (dusty occupation); middle life.

**Symptoms and Diagnosis.**—Begins as a tubercle, warty outgrowth, or ulcer; progressive growth; pain; late granular involvement; cachexia.

*Treatment.*—Circumcision when confined to prepuce; amputation.

*Operation.*—Amputation of the penis.

*Implements.*—Scalpel, scissors, dissecting forceps, tenaculum, hemostats (8), needles, retractors, periosteal elevator.

*Method.*—General or local anesthesia; prepare surface as for aseptic operation; control hemorrhage by finger compression or elastic ligature; circular incision through body of penis above growth; may modify incision so as to leave urethra and corpora spongiosum somewhat longer; clamp and ligate bleeding vessels; split and suture end of urethra to skin margins.

**Removal of Entire Penis.**—*Method.*—General anesthesia; prepare surface as for aseptic operation; lithotomy position; circular incision about the root of penis; extend to perineum; dissect soft parts; retract halves of scrotum, with a steel sound as a guide; membranous portion of urethra in front of triangular ligament is separated from corpora cavernosa and divided just behind the bulb (sound withdrawn); resect suspensory ligament; separate crura with periosteal elevator; ligate bleeding vessels; suture urethra to skin surface.

*Dressing.*—Retention catheter; gauze; cotton; bandage.

*Prognosis.*—Guardedly unfavorable.

**Fracture of Penis.**—*Definition.*—Laceration of corpora cavernosa during erection.

*Etiology.*—Violent coitus; traumatism.

*Symptoms.*—Pain; effusion of blood through the body of the penis; priapism.

*Treatment.*—Cold; incisions (curved bistoury).

*Prognosis.*—Guarded; healing with curvature of the penis may occur.

#### NEW GROWTHS.

**Fibroma; Lipoma; Osteoma.**—*Treatment.*—Removal by dissection; avoid opening the urethra.

*Prognosis.*—Favorable.

**Congenital Malformations.**—**Hypospadias.**—*Definition.*—Congenital deficiency in the floor of the urethra. May

be: (a) Balanic (opening beneath the glans); (b) penile (under surface of body of penis); (c) penoscrotal (at junction of under surface of penis with scrotum). Sterility may result from abnormally situated opening.

*Treatment.*—Plastic operation (Figs. 363, 364): (a) Dissection of skin-flaps from side of penis turned down and sutured, forming a new floor (retention catheter); (b) dissec-

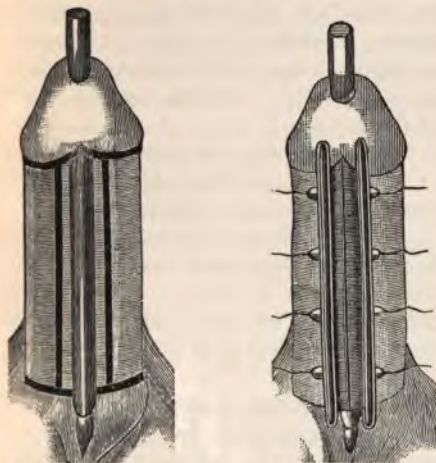


FIG. 363.—Duplay's operation for hypospadias (Duplay and Reclus).

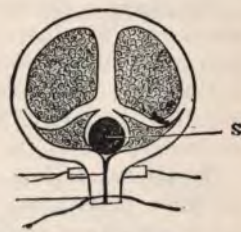


FIG. 364.—Transverse section of the penis after operation: S, The new urethra (Duplay and Reclus).

tion of urethra; transplanting by suturing to incised glans.

*Prognosis.*—Guardedly favorable.

**Epispadias.**—*Definition.*—Congenital absence of the roof of the urethra. Is rare, usually associated with extrophy of bladder.

*Treatment.*—Plastic operation; dissection of lateral flaps, suturing over a retention catheter.

*Prognosis.*—Guarded.

**Hermaphroditism.**—*Definition.*—Confusional development of the genital organs.

*Morphology.*—Most often malformation occurs in the



male sexual apparatus. Double organs in the same individual have probably never occurred.

*Treatment.*—Plastic surgery may be required. When in doubt as to sex, it is safer to regard the individual as masculine.

### URETHRA.

**Urethritis.**—**Definition.**—Inflammation of the urethra.

**Etiology.**—Traumatism; infection (gonorrhea, chancroid, syphilis); cancer; stricture; calculi; parasites; exposure to cold and wet; masturbation; drugs (cantharides); gastro-intestinal disorders; excess (alcohol); sexual contact with menstrual or leukorrheal discharge.

**Symptoms.**—Redness; heat; swelling; frequent urination; ardor urinæ; chordee; discharge (mucus, blood, pus); urinary concretions; presence of foreign body; parasites.

**Diagnosis.**—*Urethral Chancre.*—History of suspicious intercourse; incubation three weeks; confined to anterior portion of urethra; ardor urinæ felt only at meatus; no chordee; induration; painless enlargement of inguinal lymphatic glands; discharge moderate; no pus; may be bloody; secondary eruptions.

**Treatment.**—Rest; elevation; diuretics (water, milk, butter milk, demulcent drinks—flaxseed tea); hot fomentation; cold; injections (sedative, astringent); irrigation; sounds; tonics.

**Prognosis.**—Guardedly favorable.

**Stricture.**—**Definition.**—A chronic contracting peri-urethritis.

**Morphology and Etiology.**—(a) Inflammatory: Rare, due to swelling in acute anterior urethritis. (b) Spasmodic: Due to irritation, as from the passage of impacted calculi, uric-acid diathesis, cantharides, oil of turpentine; exposure; sexual excess; bladder-strain from neglect; gastro-intestinal disease; infectious fevers; hemorrhoids; rectal operations. Determine the presence of spasmodic stricture by allowing an inserted sound to fall out from its own weight. If it does not, spasmodic stricture complicates the condition. (c) Organic: May be—(1) Linear, bridle, pack-thread, valvular

(cord-like constriction); (2) annular (ring constriction); (3) irregular, tortuous (extended devious canal). Due to traumatism, chronic urethritis.

**Location.**—(a) Bulbomembranous region most common; extends from one inch in front of triangular ligament to prostatomembranous junction. (b) Anterior urethra (first  $2\frac{1}{2}$  inches—3.25 cm.). (c) Middle of spongy urethra. (d) Membranous urethra (commonest site for traumatic stricture).

**Symptoms.**—History of one to two years' development; gleet discharge; painful urination; diminished size of stream (may be forked or cork-screw); retention of urine; cystitis; hematuria; urinary extravasation with fistulae; ischio-rectal abscess; chronic nephritis with dilatation of ureters and pelvis (surgical kidney); hemorrhoids; prolapse of rectum; enlarged prostate.

**Examination.**—Measure the circumference of the body of the flaccid penis. Scale: Average ratio between circumference of penis and urethra:

3 inch	admits a sound	26–28 F.
$3\frac{1}{4}$ “	“ “ “	28–30 F.
$3\frac{1}{2}$ “	“ “ “	30–32 F.

**Method.**—Start with four sizes below (sounds, bougies à boules); perform *meatotomy* for contracted meatus.

**Operation.**—**Implements.**—Guarded scalpel or bistoury.

**Method.**—Cleanse the surface; local anesthesia; incise either the floor or the roof of the meatus to full size (30–32 F.); control hemorrhage by compression; cold.

**After-treatment.**—Daily dilatation; cleanliness. Obtain a knowledge of the condition of the urethra by employing various sized instruments.

**Passage of Sounds; Catheterism.**—**Method when using Metallic Instruments.**—Patient recumbent in dorsal position (head and shoulders slightly elevated, legs and thighs flexed); cleanse meatus; pass sterile, lubricated instrument into urethra, keeping the handle low and parallel to groin crease; draw penis toward the handle as sound or metal catheter is gradually elevated, sweeping over to the middle line; when properly inserted, handle of instrument will be

retained in this position. Always expose a woman, to catheterize her properly,

**Passage of Filiform Bougies.**—*Method.*—Twist and bend the ends of some of the filiforms (Fig. 365)—engages tortuous passage with greater ease; sterilize and lubricate; insert the bougies one after the other as far as they will go, without forcing; when urethra is filled (six to twelve) pass from one

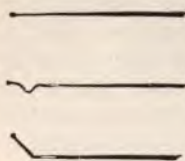


FIG. 365.—Points of Gouley's whalebone guides (filiform bougies).

to another and by gentle tapping seek to enter the end through and past the strictured site into the bladder; when inserted, the filiform may be—(a) Left in position for twelve or twenty-four hours; (b) removed at once; (c) used as a guide for the passage of tunnelled catheter (No. 8–10–12) (Fig. 366).

**Treatment.**—Diuretics (water, milk, demulcent drinks); hot hip-baths; salines; diaphoretics; gradual dilatation (if permeable to filiform bougie); internal urethrotomy with subsequent dilatation (urethrotome); cut-strictures sometimes cause sexual inability the penis will not become erect beyond the seat of operation); external urethrotomy; perineal section; suprapubic cystotomy.



FIG. 366.—Gouley's tunnelled catheter threaded on a filiform bougie.

**Operation.**—**Internal Urethrotomy.**—May be employed in strictures of small caliber when situated anterior to bulbo-membranous junction.

**Implements.**—Filiforms, sounds, bougies, urethrotomes, guarded bistoury (meatotomy).

**Method.**—Irrigate urethra with boric-acid solution; local (cocain) or general anesthesia; incise stricture in a linear direction from behind forward, through the roof of the urethra; control hemorrhage by cold; compression upon a full-sized rubber catheter.



*After-treatment.*—Full-sized sounds.

*Prognosis.*—Guarded.

**External Urethrotomy.**—External division with a guide (Syme's operation) (Fig. 367).

*Implements.*—Staff or guide, scalpel, scissors, dissecting forceps, retractors (sharp-pointed), tenaculum, hemostats (8), needles, grooved director, catheter.

*Method.*—General anesthesia, lithotomy position; prepare surface as for aseptic operation; introduce staff; incision (median, one inch and one-half long in the perineum); reach guide; pass knife into the bladder; enlarge opening and pass catheter upon grooved director as a guide.

*After-treatment.*—Passing of full-sized sounds.

*Prognosis.*—Guarded.

**Perineal Section.**—External perineal urethrotomy without



FIG. 367.—Schematic illustration of external urethrotomy: *a*, Transverse section; *b*, longitudinal section; *U*, *U*, urethra; *P*, *P*, perineum (Esmarch and Kowalzig).

a guide. Required for impermeable stricture with retention and extravasation of urine.

*Implements.*—Scalpel, scissors, hemostats (8), grooved director, tenaculum, retractors (sharp-pointed), staff.

*Method.*—General anesthesia; lithotomy position; prepare surface as for aseptic operation; incision to anterior end of stricture (staff as a guide); continue dissection in middle line to reach bladder if opening of urethra cannot be found.

*After-treatment.*—Passage of full-sized sounds.

*Prognosis.*—Guarded.

**Rupture of the Urethra.**—Most often occurs in membranous urethra.

**Etiology.**—Traumatism (crush or patient falls astride).

**Symptoms.**—Pain; tenderness, hematuria; retention of urine; extravasation of urine and blood.

**Treatment.**—Immediate passage of catheter; rest; hot

fomentations; cold; leeching; incision; suturing divided ends (urethrorrhaphy); employ catgut; do not include mucous membrane in suture.

*After-treatment.*—Sounds.

**Prognosis.**—Guarded.

**Urethral Fistula (False Passage).**—**Etiology.**—Traumatism (instrumentation in treatment of stricture); extravasation of urine.

**Treatment.**—Dilatation of urethra with sounds; incision; stimulation of edges with silver nitrate; purse-string suture after freshening the margins; dissection with curettage.

### SCROTUM.

**Orchitis.**—**Definition.**—Inflammation of the testicle. May be—(a) Acute; (b) chronic.

**Etiology.**—Traumatism; diathesis (rheumatism, gout, syphilis, tuberculosis); cancer; mumps; gonorrhea; infection.



FIG. 368.—Strapping of the testicle (Smith).

**Symptoms.**—Redness, heat, pain, swelling, vomiting.

**Treatment.**—Rest; elevation; cold; hot fomentations; strapping the testicles; mercurial ointment. Treat the diathesis; incision; excision; castration.

*Strapping the Testicle.*—*Method.*—Shave, wash, and dry scrotum; draw skin of scrotum tense; apply half-inch wide adhesive straps in concentric layers until affected side is firmly compressed (Fig. 368).

**Epididymitis.**—**Definition.**—Inflammation of the epididymis.

**Etiology.**—Traumatism; by extension (gonorrhea).

**Symptoms.**—Pain (dragging); redness; heat; swelling (epididymis and scrotum).

**Treatment.**—Rest; elevation; hot fomentations; cold; application of guaiacol, olive oil, aa, ʒj (32 gm.); strap the testicle.

**Prognosis.**—Guarded; sterility from stenosis may occur upon affected side.

**Abscess (Pyoceles).**—**Etiology.**—Traumatism; infection (gonorrheal, tuberculous). Tuberculous pyocoele consists of an encysted collection of pus, giving rise to little or no local symptoms.

**Treatment.**—Incision; excision; curettage; salines; tonics. Iodoform emulsion when tuberculous.

**Prognosis.**—Guardedly favorable.

**Hydrocele.**—**Definition.**—Collection of serous fluid in tunica vaginalis.

**Morphology.**—Congenital, encysted (spermatocele, seminal cyst, chylocele).

**Etiology.**—Congenital; traumatism; phimosis; often obscure.

**Symptoms.**—Painless swelling beginning at the bottom of the scrotum; early is soft, elastic. Later tense and hard; swelling stands out from groin; pyriform shape; translucent by transmitted light (may be opaque in traumatic cases, due to blood coloring-matter (hematocele); fluid may disappear on compression (congenital variety communicates with peritoneal cavity). A card-board cylinder blackened upon its inner side and held against the affected scrotum, before which is placed a lighted candle, will readily demonstrate translucency to the observer's eye at the other end of the cylinder.

**Treatment.**—(A) *Palliative*; tapping.

**Implements.**—Trocár and cannula.

**Method.**—Recumbent posture; prepare surface as for aseptic operation; local anesthesia; grasp scrotum firmly; thrust trocar, guarded by thumb, from below upward in front of tumor (testicle is behind); avoid superficial veins by inspection; draw off fluid; seal orifice (Fig. 369).



*After-treatment.*—Suspensory bandage.

(B) *Radical Cure.*—*Method.*—(a) Withdraw fluid with trocar and cannula; inject one to four drops of pure carbolic acid; massage the scrotum. (b) Irrigate the tunica sac with hot water by means of double trocar and cannula (Fig. 370). (c) Incision with drainage. (d) Excision of parietal layer of tunica vaginalis by dissection.

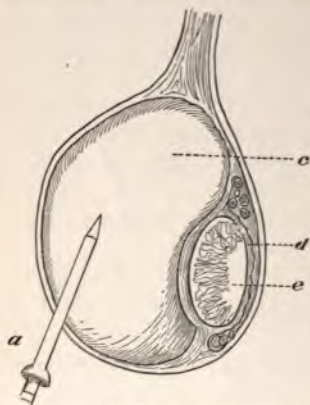


FIG. 369.—Hydrocele testis chronica : *c*, Hydrocele; *e*, testis; *d*, epididymis; *a*, direction of introduction of trocar.

**Treatment.**—Suspensory bandage; salines; treat the cause; incision.

**Prognosis.**—Guarded.

**Varicocele (Cirrocele).**—**Definition.**—Varicose veins in the spermatic cord.

**Etiology.**—Traumatism; early, single life; occupation; heredity; constipation.

**Prognosis.**—Favorable.

**Edema of the Scrotum.**—

**Etiology.**—Traumatism; chronic (heart, lung, liver, kidney disease); extravasation of urine; superficial infection.

**Diagnosis.**—Bilateral; doughy; disappearance of scrotal folds; glazed skin; albuminuria; symptoms of heart, lung, liver, or kidney disease.

**Treatment.**—Suspensory bandage; salines; treat the



FIG. 370.—Beck's irrigation trocar.

**Symptoms.**—Left side most frequently affected; mass of enlarged, tortuous, elongated veins (feels like mass of earth worms); dragging pain (worse in summer, due to relaxa-

tion); swelling decreases when patient lies down; testicle upon affected side smaller and softer.

**Treatment.**—Suspensory bandage; subcutaneous ligation; constriction with harelip pins and figure-of-eight ligatures; excision.

**Excision.**—*Implements.*—Scalpel, scissors, dissecting forceps, retractors (sharp-pointed), needles, aneurysm needle.

*Method.*—General or local (cocain) anesthesia; prepare surface as for aseptic operation; incision (longitudinal, one to two inches (2.5–5 cm.) over venous mass); dissect the soft parts; retract; reach the cord and enlarged veins; separate major portion of veins from vas deferens; pass double ligatures at each end of varicose mass; leave upper and lower ligature ends long; resect the mass; bring the stumps together by tying the ligature ends together; close skin wound; shorten scrotum of affected side by resection and suturing if necessary—some operators claim it is unnecessary to resect the scrotum.

*Dressing.*—Gauze; suspensory bandage.

**Prognosis.**—Favorable.

**New Growths.**—**Elephantiasis of the Scrotum.**—Characterized by enormous hypertrophy of the subcutaneous connective tissue.

*Treatment.*—Excision.

**Epithelioma of the Scrotum (Soot Cancer; Chimney-sweep's Cancer).**—Begins as a scaling or incrustated wart; ulceration; extension to the testicles, penis, inguinal lymphatics.

*Treatment.*—Early excision.

*Prognosis.*—Guardedly unfavorable.

**Carcinoma of the Testicle (Malignant Sarcocoele).**—*Morphology.*—Soft (encephaloid), scirrhus, melanotic.

*Symptoms and Diagnosis.*—Early life; rapid growing tumor; unilateral; smooth first, later becomes lobulated (rupture of tunica albuginea, with adhesion to scrotum); ulceration (fungoid); offensive discharge; lymphatic involvement; pain; cachexia.

**Syphilitic Sarcocoele (Syphilitic Orchitis).**—Painless; bilateral; stony hardness; slow growth; skin freely movable; no fis-

tulæ; ulceration rare; history and additional symptoms of syphilis.

**Tubercular Sarcocoele (Tubercular Orchitis).**—Early life; hereditary taint; epididymis usually first involved; bilateral; painless; sinus formation; secondary tuberculosis.

*Treatment.*—Early castration.

*Castration.*—*Definition.*—Removal of a testicle.

*Implements.*—Scalpel, scissors, dissecting forceps, hemostats (8), tenaculum, vulsellum forceps, needles, retractors (sharp-pointed).

*Method.*—General anesthesia; prepare surface as for aseptic operation; incision from a point much below the scrotum; retract soft parts; dissect and expose testicle; apply double ligatures to the cord, high up; resect (dissection for removal of the cord may extend into the abdominal cavity, for malignant involvement if necessary); close external wound.

*Dressing.*—Gauze, cotton, bandage.

*Prognosis.*—Guardedly unfavorable.

**Sarcoma of the Testicle (Malignant Sarcocoele).**—*Morphology.*—Any form may occur.

*Symptoms and Diagnosis.*—Early life; slow growth; painless; early, cystic (cystic testicle, hydatid testicle); uniform enlargement; large size; cachexia.

**Hematocoele.**—History of traumatism; rapid growth, absorption may occur.

*Treatment.*—Castration; castration with excision of the cord; dissection of abdominal lymphatics.

*Prognosis.*—Guardedly unfavorable.

## SPERMATIC CORD.

**Hydrocele of the Cord.**—May be: (a) Diffused; (b) encysted.

*Etiology.*—Traumatism; congenital malformation.

*Symptoms.*—Elongated swelling; soft; fluctuating; changes shape when patient rises from recumbent to erect position; may be translucent; impulse upon coughing and may be accompanied by hernia.

*Treatment.*—Compression; aspiration; aspiration and in-



jection of a drop or two of carbolic acid; seton (drainage by passing a silk thread through the sac-cavity); dissection, with radical cure of hernia.

**Prognosis.**—Favorable.

**Hematocele of the Cord.**—May occupy a similar position to hydrocele.

**Etiology.**—Traumatism; spontaneous (rupture of spermatic vein).

**Symptoms.**—Opaque swelling; painless; no impulse upon coughing; may be absorbed.

**Treatment.**—Hot fomentation; cold; compression; aspiration and compression; incision; removal of clot; ligation (cocain anesthesia). Close wound.

**Dressing.**—Compression bandage; suspensory.

**Prognosis.**—Favorable.

**New Growths.**—**Lipoma.**—May be: (a) Single; (b) multiple.

**Symptoms.**—Painless, slow-growing, smooth, firm swelling.

**Treatment.**—Dissection under local anesthesia when uncomfortable size.

**Prognosis.**—Favorable.

**Malignant Growths.**—Sarcoma and carcinoma are rarely primary, being usually extensions from the testicle.

**Treatment.**—Early and radical removal with castration and dissection of abdominal lymphatic glands.

**Prognosis.**—Unfavorable.

**Congenital Malformations.**—Congenital absence of one (**monorchidism**) or both (**cryptorchidism**) testicles may occur. Diagnosis from double undescended testicle by examining seminal discharge for spermatozoa. Supernumerary testicles (detachment of portions of globus major from the epididymis) have been noted.

**Undescended Testicle (Retained Testicle).**—**Definition.**—An arrest in the normal descent of the testicle.

**Etiology.**—Congenital deformity; traumatism associated with lax abdominal rings. One or both testicles may be involved.

**Symptoms.**—Absence of testicle in the scrotum; pain (peculiarly sickening, due to compression); tumor of the size

and shape of a testicle may be demonstrated at the entrance or contained in the inguinal canal.

**Treatment.**—Palliative—truss or pad compress to retain testicle in position; operative—(a) dissection and transplantation (orchidopexy); (b) excision (castration) required for continuous pain, inflammation.

**Prognosis.**—Favorable.

**Twist in the Cord (Strangulated Testicle).**—**Symptoms.**—Sudden pain; shock; rapid swelling; gangrene development.

**Treatment.**—Untwist by manipulation; open operation; castration.

**Prognosis.**—Favorable.

## PROSTATE GLAND.

**Prostatitis.**—**Definition.**—Inflammation of the prostate gland. May be—(a) Acute; (b) chronic—prostatorrhœa.

**Acute Prostatitis.**—**Etiology.**—Traumatism (instruments, strong injections); gonorrhœa; exposure (cold and wet); vesical or prostatic calculi; alcohol; sexual excess.

**Symptoms.**—Pain and weight in perineum; frequent difficult urination (dysuria); vesical tenesmus; increased symptoms at defecation.

**Diagnosis.**—By rectal examination. Employ for finger lubrication:

R. Pulv. white or Castile soap . . . . .	$\text{f}\overline{\text{ss}}\text{iv}$ (128 c.c.).
Acid. carbolic. . . . .	$\text{f}\overline{\text{ss}}\text{ij}$ (8 c.c.).
Glycerin . . . . .	$\text{f}\overline{\text{ss}}\text{ij}$ (64 c.c.).
Aquæ . . . . .	$\text{f}\overline{\text{ss}}\text{ij}$ (64 c.c.).

M. Sig.—Soap mixture.

**Complications.**—Abscess; retention of urine.

**Treatment.**—Enforced rest; hot fomentations; ice suppositories; cold-water irrigations; cups or leeches to perineum; opium suppositories for pain; laxatives; catheterism (for complete retention). Incision through perineum with drainage for abscess (may drain through urethra).

**Internal.**—Diuretics (water, milk, buttermilk).

**Prognosis.**—Guardedly favorable.

**Chronic Prostatitis (Prostatorrhea).—Etiology.**—Follows acute attacks; posterior urethritis; sexual excess.

**Pathology.**—An inflammation of the follicles of the prostate gland. Follicles enlarged, filled with prostatic fluid and pus.

**Symptoms.**—Prostatic discharge at stool and after morning erection; history of sticky discharge (like glycerin or white of egg) at close of urination; sense of fulness and heat in the rectum; increased urination, with twist and dribbling; nocturnal emissions frequent; imperfect ejaculation; failure of erection; sexual neurasthenia.

**Diagnosis.**—History of two or three attacks of gonorrhea or else prolonged sexual orgies; long-continued practice of premature withdrawal in intercourse (unrelieved congestion). Discharge contains very few, if any, spermatozoa.

**Rectal Examination.**—Prostate enlarged; soft; massage causes exudation of fluid from penis.

**Treatment.**—Remove the cause; improve hygiene (correct habits, sexual rest); full-sized sounds (cold) passed once or twice a week, retained three to five minutes (local tonic effect); cold-water irrigation to prostatic urethra (return metal catheter, psychrophor); ice suppositories; counter-irritation to perineum (small blisters, cautery); laxatives:

R. Strychnin. sulph. . . . . gr. ss (0.033).  
 Acid. phosphoric. dil. . . . . f℥j (32 c.c.).  
 Aquæ . . . . . q. s. ad f℥iij (96 c.c.).

Sig.—One teaspoonful after each meal.

**Prognosis.**—Guardedly favorable.

**Hypertrophied Prostate (Chronic Hypertrophy of the Prostate).—Definition.**—Organic enlargement of the prostate gland.

**Etiology.**—Obscure; predisposing cause, late middle life.

**Pathology.**—General fibromyomatous overgrowth, with but little alteration in the glandular tissue. Development may be unilateral, bilateral (general), confined to the central portion (third lobe of the prostate). Growth varies in size from a pea to a small orange; may reach a weight of 14 ounces (448 gm.); may contain a number of encapsulated tumors similar to uterine fibroids.



Urethra elongated (general enlargement), narrowed, distorted (unilateral enlargement); growth may act as a valve (middle portion affected).

Bladder distorted, dilated, inflamed (cystitis).

Kidney: Dilatation of ureters and pelvis with chronic septic nephritis (surgical kidney).

**Symptoms and Diagnosis.**—Diminished force in urination; frequent urination, marked at night; retention of urine; incontinence of retention. Increased sexual desire (local congestion); prostatocystitis; urination most satisfactory at stool or after intercourse; constipation. Catheterism determines presence of residual urine; prostatic urethra curves when middle lobe affected (middle lobe not apparent through the rectum). Rectal examination: Enlarged gland.

**Treatment.**—(A) Palliative; when residual urine is less than  $\text{f}\bar{\text{z}}\text{ij}$  (96 c.c.) and patient not disturbed at night; improve hygiene (light nutritious diet; no alcohol; avoid constipation). Relief for one or more years.

(B) When residual urine equals  $\text{f}\bar{\text{z}}\text{iv}$  (128 c.c.) and patient required to urinate three or four times during the night: Systematic catheterism (one or more times daily). Relief for one to two years.

(C) Increased symptoms unrelieved by catheterism: Tapping the bladder, with permanent drainage.

**Method.**—Median or perineal puncture with trocar and cannula (insertion of self-retaining catheter). Treat the cystitis.

(D) Operative: Excision of a portion of the enlarged gland (prostatectomy).

**Prostatectomy.—Definition.**—A more or less complete excision of an enlarged prostate gland.

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (12), grooved director, tenaculum, vulsellum forceps, curet, staff (urethral guide), rectal bag, needles, retractors (dull, sharp-pointed).

**Method.**—General anesthesia; prepare surface as for aseptic operation; irrigate bladder (warm sterile salt or boric-acid solution); inflate bladder with air or inject 6 to 10 ounces (192–320 c.c.) of water (retain by elastic ligature to penis); insert rectal bag; inflate rectum (throws bladder

forward). Incision: (a) Suprapubic: Patient in dorsal position; median three inches long, extending upward from half an inch (1.25 cm.) above the pubes; dissect the soft parts; retract; reach the transversalis fascia; divide; retract cellular tissue and veins; reach the bladder; draw the bladder forward with a tenaculum; incise.

(b) Perineal: Lithotomy position; staff passed as a guide; through raphé between scrotum and anus; expose membranous urethra; incise upon staff; enlarge opening and enter the bladder by boring through with fingers; enucleate with the fingers, curet, or remove portions of prostate by tension with forceps; close external wound or drain.

Electric cauterization (Bottini's operation), performed by aid of electrocautery passed through the urethra.

*Prognosis.*—Guarded

**Calculus.**—Prostatic calculi may arise from deposited inspissated secretion; impaction from kidney or bladder.

**Diagnosis.**—May be located by sound (searcher); rectal examination.

**Treatment.**—Urethral forceps; median perineal lithotomy.

*Prognosis.*—Guardedly favorable.

**Malignant Disease.**—Sarcoma and carcinoma (encephaloid may be diagnosed by rapidity of growth; hemorrhage (frequent, severe); cachexia.

**Treatment.**—Early, excision. Palliative, cauterization; cystotomy for drainage.

*Prognosis.*—Unfavorable.

**Tuberculosis.**—Usually secondary to bladder or kidney affection.

**Diagnosis.**—High-grade inflammation; tubercular ulcers by cystoscopic examination.

**Treatment.**—Tonics; supportive; improve hygiene; instillations of silver nitrate (2 to 10 per cent.).

*Prognosis.*—Unfavorable.

#### BLADDER.

**Cystitis.**—**Definition.**—Inflammation of the bladder. May be: (a) Acute; (b) chronic (catarrh of the bladder) most common.



**Etiology.**—Traumatism (catheterism); calculus; drugs (cantharides, turpentine); by extension (urethritis, stricture, tuberculosis); exposure; gout; enlarged prostate; eruptive fevers; displacements (bladder, uterus).

**Pathology.**—Bladder mucous membrane red, swollen, covered with tenacious mucus; exfoliation of mucous lining may occur; ulceration with hemorrhages; purulent infiltration of entire thickness of bladder; organized exudate (membranous cystitis) may occur.

**Symptoms.**—Increased frequency of urination; pain over and behind the pubis, perineum, sacral region, and thighs; vesical tenesmus—desire to strain; tenderness upon pressure (catheter, rectal or vaginal examination); urine alkaline, specific gravity 1005 to 1015, turbid, heavy deposit of mucus-shreds, pus, blood; fever; retention of urine.

**Treatment.**—*Acute.*—Enforced rest; hot fomentations; cups, leeches to hypogastrium and perineum; salines; hyoscyamus and opium suppositories for pain and tenesmus; mild diuretics (water, milk, buttermilk, infusion of flaxseed); restricted diet; gentle catheterization for retention (soft-rubber instrument).

*Chronic.*—Cubebs and copaiba (āā gr. v—0.333 gm.) capsules; buchu infusion, fʒj—ij (4–8 c.c.) three or four times a day; salol (gr. v—0.333 gm.); boric acid (gr. v—0.333 gm.); bladder irrigation (hot sterile water, boric-acid solution (2 to 10 per cent.)—affects heart sometimes; if so, stop its use and employ benzoic acid (2 to 10 per cent.)); hydrogen dioxid (10 per cent. to full strength); zinc sulphate (gr. j—0.066 gm. to fʒj—32 c.c. of water); copper sulphate (gr. j—0.066 gm. to fʒj—32 c.c. of water); silver nitrate ( $\frac{1}{8}$  to 2 per cent.); permanganate of potassium ( $\frac{1}{2}$  to 4 per cent.); carbolic acid (1:500); creolin (1 to 5 per cent.); dilatation of urethra (females); cystotomy.

**Cystotomy for Permanent Drainage of the Bladder in Females.**—*Implements.*—Scalpel, scissors, hemostats (8), tenaculum, vulsellum forceps, dissecting forceps, sound, needles.

*Method.*—General anesthesia; irrigation of bladder and vagina; patient in lithotomy position; use sound as a



guide; incise upon tip of sound; enlarge the opening; suture bladder mucous membrane to vaginal; examine bladder through opening; irrigate.

*Caution.*—Do not distend the bladder beyond the painful point in irrigating; commence with f3j-ij (32-64 c.c.) first day.

*Prognosis.*—Guarded.

**Retention of Urine.**—**Definition.**—Inability completely to empty the bladder without instrumentation.

**Etiology.**—Traumatism (foreign body, blood-clot, calculus, ruptured urethra); tumor; pregnancy; fecal impaction; paralysis; shock; drugs, as opium, cantharides, belladonna; congenital malformation (occlusion); enlarged prostate or old tight stricture in which exposure or alcoholic excess gives rise to congestion at the neck of the bladder; acute spasmodic contraction of the compressor urethræ muscle, as from neglect to empty the bladder at proper intervals—stammering; hysteria.

**Pathology.**—Occlusion, partial or complete, from blood-clot, foreign body, rupture; clonic spasm of compressor urethræ muscle; acute congestion of prostatic mucous and submucous tissue.

**Symptoms and Diagnosis.**—Gradually formed, fluctuating hypogastric (may extend above the umbilicus) tumor, dull on percussion; flank resonance; constant desire to urinate; vesical tenesmus and death; may have constant dribbling (incontinence or retention).

**Complications.**—Atony of the bladder; rupture; acute suppression; surgical kidney.

**Treatment.**—Hot fomentations; hot hip-baths; full hot bath for one hour with hypodermic injection of morphin; enemata; opium suppositories; catheterism; aspiration (suprapubic) best, perineal through the rectum. In hysteria pass a catheter once to eliminate organic conditions; afterward treatment is moral and hygienic.

*Caution.*—If enlarged prostate is the cause of retention, do not drain off all the urine at one sitting—danger of death from shock, acute suppression.

*Method.*—Local or general anesthesia; prepare surface

as for aseptic operation; median incision down to bladder fat; insert trocar. Draw off  $\text{f}\overline{\text{3}}\text{vj}$  or  $\text{viij}$  (192 or 256 c.c.); inject  $\text{f}\overline{\text{3}}\text{j}$  (32 c.c.) of boric-acid solution (teaspoonful—4 gm.—of drug to the pint—512 c.c.—of water); twelve hours later draw off  $\text{f}\overline{\text{3}}\text{vj}$  or  $\text{viij}$  (192 or 256 c.c.); repeat boric-acid injection; continue procedure until, by end of two or three days, normal action will have started up.

**Prognosis.**—Guarded.

**Atony of the Bladder.**—**Definition.**—Loss of bladder tone. When neck of bladder affected, have incontinence; body of organ involved, retention.

**Etiology.**—Senility (physiologic); excess (alcohol, sexual); traumatism (spinal injury); low fevers; phimosis; calculi (preputial, vesical); parasites; epilepsy; incontinence of childhood (enuresis).

**Pathology.**—Functional nervous exhaustion, when due to excess; atrophy of the muscular coat (fibroid change) or fatty degeneration in organic or senile conditions. Urine retained known as residual.

**Complications and Sequelæ.**—Cystitis; uremia.

**Symptoms and Diagnosis.**—Frequent urination; dribbling (incontinence, incontinence of overflow or retention); presence of tumor; fluctuation transmitted from hypogastrium to finger pressed upward from within the rectum; catheterism may determine presence of residual urine.

**Treatment.**—Treat the cause. A frequent cause of nocturnal enuresis in children is preputial adhesion (occurs in both males and females). Treat by uncovering the glans in the male and by reflecting the hood of the clitoris in the female child. Improve hygiene; tonics (strychnin, quinin); belladonna; salines; irrigation (boric-acid, 2 to 10 per cent.; potassium permanganate,  $\frac{1}{8}$  to 4 per cent.); gradually reduce temperature for tonic effect; systematic catheterism.

**Method.**—Instruct patient in care and method of insertion. Four ounces (128 c.c.) of residual urine requires catheterism night and morning; six ounces (192 c.c.) requires withdrawal once every eight hours; eight ounces (256 c.c.) once every six hours.

Incontinence in the female has been treated by dissecting



the urethra from its anterior attachments, twisting it (one-half to one turn), and suturing.

**Prognosis.**—Guarded.

**Irritability of Bladder (Neuralgia; Spasm; Cystalgia).**—**Etiology.**—Nervous reflex, as from eye-strain; tumor (urethral caruncle); cystitis; fissure at the neck of the bladder; malaria.

**Symptoms.**—Painful and frequent urination; vesical tenesmus—desire to strain.

**Treatment.**—Improve hygiene; potassium bromid (gr. x—0.666 gm.), opium, belladonna.

R. Atropin. sulph. . . . . gr. ss (0.033 gm.).

Aqua dest. . . . . ℥iv (128 c.c.).

M. Sig.—Five drops (0.333 c.c.) in water before each meal.

Treat the cause.

**Prognosis.**—Guardedly favorable.

**Hematuria.**—**Definition.**—Blood in the urine.

**Etiology.**—Traumatism (kidney—smoky urine—ureter, bladder, prostate, urethra); acute congestion; gonorrhea; tuberculosis; *Filaria sanguinis hominis* (intermittent); calculi; new growths (cancer, villous, papilloma of the pelvis of the kidney); instrumentation; exposure; excess.

**Symptoms and Diagnosis.**—*Kidney.*—Urine intimately mixed with blood (smoky); clot. Cystoscope.

*Ureter.*—Clot or bright-red jets of blood by cystoscopic examination.

*Bladder.*—Clot or bright-red blood; urine first passed may be clear; shreds of bladder epithelium or from new growth will aid diagnosis; cystoscope.

*Prostate.*—First and last urine passed bloody; rectal examination.

*Urethra.*—First urine bloody (clots or bright red); history will aid diagnosis.

**Treatment.**—Rest; gallic acid; opium; treat the cause.

**Prognosis.**—Guarded.

**Foreign Bodies.**—(a) From without; (b) by perforation (gall-stones; necrosis of intestine; dermoid cyst; fecal concretions; womb-stones; portions of a fetus); (c) calculi.



**Vesical Calculi (Stone in the Bladder; Gravel).**

**—Etiology.**—Predisposing causes: Early life; male sex; residence in lime-stone districts; rheumatism; gout; lithemia; enlarged prostate; atony of bladder; catarrhal nephritis; cystitis; cystocele; operation for closure of vesicovaginal fistula in females.

**Morphology and Pathology.**—(a) Acid urine; uric-acid calculi; urates; oxalate of lime; cystin; xanthin.

(b) Alkaline urine: Phosphate or carbonate of lime calculi; phosphatic (ammoniomagnesian) originate in bladder in ammoniacal urine.

Stone nucleus may be uric acid (two-thirds of all cases); oxalate of lime; urates; inspissated mucus; blood-clot; foreign bodies.

**Symptoms and Diagnosis.**—Frequent urination; pain (darting) during urination referred to glans penis (increased at the end of the act); pain, tenderness, sense of weight in hypogastrium, rectum, perineum, thighs, or distant parts, as



FIG. 371.—Keyes stone-searcher.

foot (podalgia); sudden interruption of stream; incontinence; hematuria; priapism; seminal emissions; prolapse of rectum; rectal examination; passage of sound or stone-searcher; cystoscope; bimanual (hypogastrium and vaginal, aided by still sound in females).

**Sounding for Stone.**—**Instrument.**—Straight steel sound with short curved, flat beak, size No. 12 to 14 F. (Fig. 371).

**Method.**—Patient recumbent (dorsal position with hips slightly elevated); may employ general anesthesia; insert searcher after sterilizing and lubricating (facilitate entrance into bladder by downward pressure at the root of the penis—straighten vesical curve); pursue systematic examination; stone detected by touch and sound (click).

Failure to detect a stone may be due to—(a) Encysted (buried within bladder-wall); (b) sacculated bladder; (c) attached to anterior wall or suspended from the roof; (d) stone may be covered with lymph or blood-clot. In doubt

ful cases repeated examinations with final exploratory cystotomy may be necessary.

**Treatment.**—Preventive; improve hygiene; laxatives; encourage free water-drinking; milk; buttermilk; restrict diet (avoid as far as possible meat, fats, sugar, alcohol); treat vesical catarrh. Administer alkalis (salol, sodium bicarbonate, sodium phosphate) when urine is acid; phosphoric, muriatic, nitromuriatic acids when urine is excessively alkaline. Operative: (a) Crushing a stone in the bladder with removal of fragments at one sitting (litholapaxy); incision into the bladder with removal of the stone—lithotomy: (a) perineal lithotomy (median, lateral); (b) suprapubic lithotomy.

**Litholapaxy.**—*Definition.*—Crushing and removal of a stone in the bladder at one sitting. Is the operation of choice.

*Implements.*—Lithotrite (Fig. 372), evacuator (Fig. 373), sound, stone-searcher.



FIG. 372.—Lithotrite.

*Preparation.*—Enforced rest for two or four days; restricted diet, milk, free water-drinking; daily irrigation of the bladder (sterile water, salt solution, teaspoonful to a pint of water, boric acid, 1 to 10 per cent.; potassium permanganate,  $\frac{1}{8}$  to 4 per cent.; nitrate of silver,  $\frac{1}{10}$  to  $\frac{1}{2}$  per cent.; accustom the urethra and bladder to instrumentation; laxatives; salol or boric acid, gr. v-x (0.333–0.666 gm.) four times daily; shave pubes.

*Method.*—Patient recumbent in dorsal position; may em-

ploy general anesthesia; inject six or eight ounces of boric-acid solution (2 to 5 per cent.); air may be used to dilate the bladder; introduce lithotrite; expand blades gently; grasp stone; crush; repeat crushing until stone is pulverized; clear bladder of fragments with aid of evacuator.

*Complication.*—Clogging of lithotrite, preventing withdrawal of instrument; treat by performing lithotomy (suprapubic or median perineal).

**Perineal Lithotomy.**—*Definition.*—Removal of a stone by incision through the perineum.



FIG. 373.—Bigelow's evacuator.

(A) **Median Lithotomy.**—*Implements*—Scalpel, scissors, dissecting forceps, lithotomy knife, staff, probe-pointed bistoury, lithotomy forceps, scoop, curet, catheter, hemostats (6), lithotrite, needles.

*Method.*—General anesthesia; prepare the surface as for an aseptic operation; irrigate the bladder with boric-acid solution or sterile water, allowing f̄iv–vj (128–192 c.c.) to remain; dorsosacral (lithotomy) position; introduce a staff into the urethra, hold in the median line well up under the pubes, using it as a guide; incision in the raphé between scrotum and anus; expose membranous urethra; incise upon staff; introduce finger; locate stone; remove staff; remove





FIG. 374.—Peterson's colpeurynter.

stone with fingers, forceps, scoop. Avoid entering rectum or incising bulb.

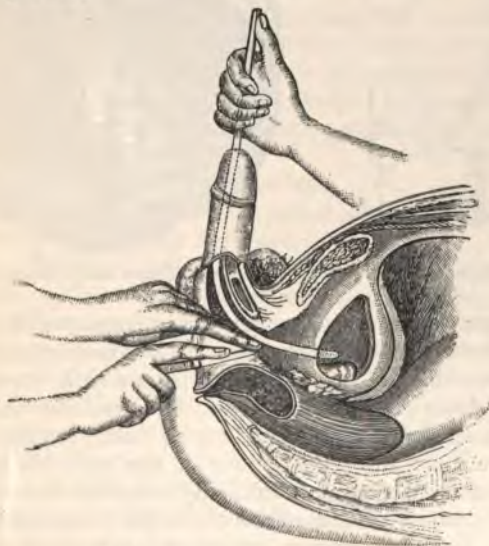


FIG. 375.—Lateral lithotomy (Tillmanns).

*Dressing.*—Light gauze packing; perineal binder.

*After-treatment.*—Rest; cleanliness.

(B) **Lateral Lithotomy** (Fig. 375).—*Method.*—General anesthesia; patient in lithotomy position (dorsosacral, pelvis slightly elevated, legs flexed upon thighs, thighs upon abdomen); prepare surface as for aseptic operation; irrigate and inject f3iv-vj (128-192 c.c.) of boric-acid solution; sterile water; insert the staff; incision from a point a little to the left of the raphe of the perineum and from an inch to an



FIG. 376.—Catheter *en chemise*.



FIG. 377.—Dilated ribbed bladder (Stengel).

inch and one-half in front of the anus, downward and outward to about midway between the tuber ischii and the anus (avoid wounding the rectum by keeping a little nearer to the tuberosity than the gut); deepen the incision anteriorly; expose the staff; enter the bladder by enlarging the incision, passing the knife along the groove of the staff (blade parallel with the external wound, lateralizing); locate the stone with the finger; remove the staff; remove the stone with the aid of fingers, forceps, scoop; crush to convenient size with

lithotrite if necessary; irrigate; pack wound with gauze or soft catheter and packing—catheter *en chemise* (Fig. 376).

*Dressing.*—Light gauze, cotton, perineal binder.

*After-treatment.*—Rest; local cleanliness.

**Suprapubic Lithotomy.**—*Definition.*—Removal of a stone through an incision above the pubis.

*Implements.*—Scalpel, scissors, dissecting forceps, retractors (sharp-pointed, dull), tenaculum, hemostats (6), rectal bag, lithotrite, calculus forceps, staff, needles.

*Method.*—General anesthesia; prepare surface as for aseptic operation; patient recumbent in dorsal position; irrigate the bladder, inject from six to ten ounces (192–320 c.c.) of boric-acid (2 to 5 per cent.) solution; retain by applying an elastic ligature to the penis; insert and inflate a rectal bag; incision, median, extending upward for 3 inches (7.5 cm.) from a point one-half inch (1.25 cm.) above the edge of the os pubis; dissect and retract the soft parts; reach the transversalis fascia, divide and reach areolar tissue and venous plexus; retract; reach the bladder; draw the bladder forward with a tenaculum; incise; enlarge the incision; retract the bladder or pass retention sutures; locate the stone with the finger; remove it with finger or forceps; irrigate; if the bladder-wall is healthy, close the wound by sutures (closely applied; do not include the mucous membrane); drain the lower end of abdominal wound.

*Dressing.*—Gauze, cotton, bandage.

*After-treatment.*—Rest; abdominal supporter.

*Prognosis.*—Guardedly favorable.

**Stone in Female Bladder.**—*Treatment.*—(a) Dilatation of the urethra, with removal by finger, forceps, scoop; (b) dilatation, with passage of lithotrite and performance of litholapaxy; (c) suprapubic lithotomy.

*Prognosis.*—Guardedly favorable.

**New Growths.**—May be: (a) Benign: Fibromata, fibromyxomata, papillomata, cysts. (b) Malignant: Sarcoma, epithelioma.

**Symptoms and Diagnosis.**—Frequent urination, pain; tenesmus; hematuria; cystitis. Diagnose by cystoscope; examination of urine—shreds.



**Treatment.**—Early excision; suprapubic or perineal incision. Growth may be ligated, curetted, twisted off, or cauterized.

**Prognosis.**—Guarded for benign; guardedly unfavorable for malignant.

**Tuberculosis of the Bladder.**—May be: (a) Primary (rare); (b) secondary, by extension from surrounding parts.

**Symptoms and Diagnosis.**—Vesical irritability; hematuria; cystitis; detection of tubercle bacilli in the urine; detection of tuberculous ulceration by cystoscopic examination.

**Treatment.**—Improve hygiene; tonics; irrigation with boric acid (2 to 5 per cent.), silver nitrate (1 to 2 per cent.), injection of methyl-blue; cystotomy, with excision; cauterization of ulcers.

**Prognosis.**—Unfavorable.

**Congenital Malformation.—Extroversion; Extrophy of the Bladder.**—*Definition.*—Congenital absence of the anterior wall of the bladder. Is usually associated with epispadias.

*Symptoms and Diagnosis.*—Absence of abdominal parietes, with protrusion of mucous lining of posterior wall of bladder, appearing like a tumor; covered with tenacious mucus; constant dribbling of urine.

*Treatment.*—Plastic operation (Fig. 378).

*Implements.*—Scalpel, scissors, dissecting forceps, hemostats (12), retractors, needles.

*Method.*—General anesthesia; prepare surface as for aseptic operation; dissect and turn down apron flap from above; attach to freshened edges of sides and bottom of bladder opening, leaving space for urinary orifice below; dissect flaps from sides of abdomen, covering in subcutaneous surface of apron flap; suture; secure drainage by soft-rubber catheter.

*Dressing.*—Light gauze, cotton, bandage.

*After-treatment.*—Permanent portable urinal; further plastic work may be carried out at subsequent operation.

*Prognosis.*—Guarded.

**Hernia of the Bladder (Cystocele).**—May be congenital or acquired.

*Symptoms and Diagnosis.*—Fluctuating swelling above the pubes or in the anterior vaginal wall; irreducible; impulse on coughing; pressure causes urine to flow; passage of sound determines bladder outlines.

*Treatment.*—Truss; compression bandage.

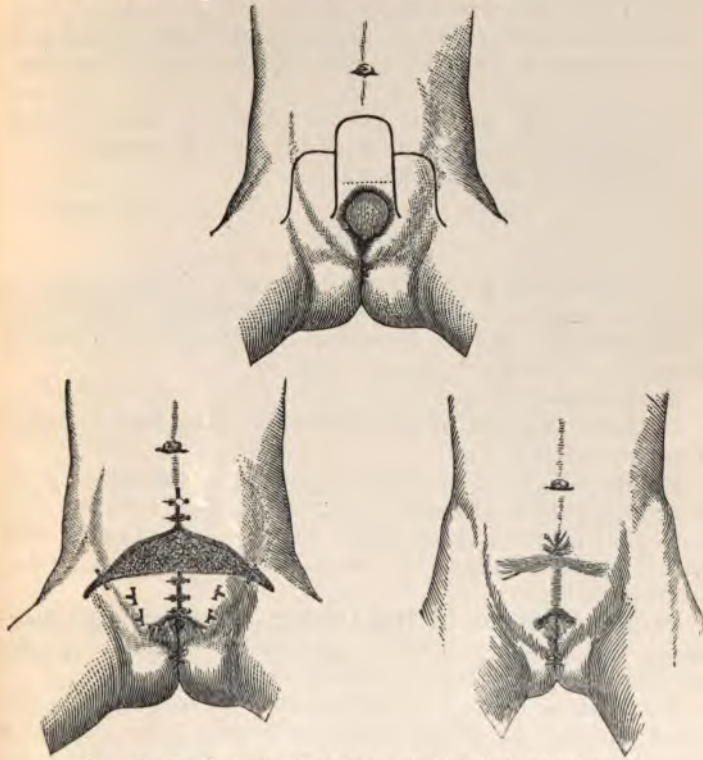


FIG. 378.—Plastic operation for extroversion of the bladder (Ashhurst).

Operative treatment in male usually unsatisfactory.

**Vaginal Cystocele.**—*Treatment.*—Repair tears in perineum; purse-string suture after oval denudation of mucous membrane covering the tumor; formation of longitudinal folds of mucous membrane by denudation and suturing.

*After-treatment.*—Rest; catheterism; avoidance of strains and of sexual intercourse for one or two months.

*Prognosis.*—Guarded.

**Inversion of the Bladder.**—*Definition.*—A rare affection in which protrusion of bladder mucous membrane takes place through the urethra in females.

*Symptoms and Diagnosis.*—Incontinence; presence of red, vascular tumor at urethral orifice; openings of ureters may be detected.

*Treatment.*—Recumbent position (dorsal); instrumental replacement (bulbous bougie); scarification of urethra.

*Prognosis.*—Guardedly favorable.

## URETERS.

May be divided or crushed with forceps accidentally during course of pelvic operations; excised with malignant growths.

**Treatment.**—Unite divided ends by suturing; suture upper end of ureter to surface wound.

**Prognosis.**—Guarded.

**Catheterization of the Ureters.**—Required for diagnostic purposes.

**Method.**—General anesthesia; patient in lithotomy position; irrigate bladder and inject f3iv-f3viiij (128–256 c.c.) boric-acid solution (teaspoonful to pint—4 to 512 c.c.—of water); pass catheters by direct illumination with cystoscopic attachment.

**Impacted Stone in the Ureter.**—**Symptoms and Diagnosis.**—Pain (colic); localized tenderness; obstruction, with dilatation of pelves (hydronephritis) (Fig. 379).

**Treatment.**—Rest; hot fomentations; opium, bromids (for pain); salines; laparotomy, median incision when in doubt as to location; upper third (ureterotomy, ureterolithotomy).

*Operation.*—Ureterotomy, ureterolithotomy.

*Definition.*—Incision into the ureter.

*Implements.*—Scalpel, scissors, dissecting forceps, probe, aneurysm needle, grooved director, hemostats (10), retractors (sharp, dull), needles.

*Method.*—General anesthesia; patient semiprone; prepare



surface as for aseptic operation; incision curved from just below last rib, extending toward middle of Poupart's ligament, thence toward external border of rectus muscle (Israel's incision); divide skin, superficial fascia, areolar tissue; external oblique, internal oblique, transversalis muscles; lumbar fascia; dissect areolar tissue; expose ureter extending down from kidney; massage or incise ureter, removing stone; probe ureter above and below; close by suturing; drainage.

*Dressing.*—Gauze, cotton, bandage.

*Prognosis.*—Guarded.

#### URACHUS.

**Patulous Urachus (Urachal Fistula).**—*Symptoms.*—Discharge of urine from the navel.

*Treatment.*—Cauterization; ligation; dissection, with ligation.

*Prognosis.*—Favorable.

Sacculated form of urachus known as supernumerary bladder has been noted.

#### KIDNEY.

**Nephritis (Bright's Disease).**—*Definition.*—Inflammation of the kidney.

May be: (a) Acute; (b) chronic.

*Etiology.*—Male sex; middle life; exposure; alcohol; syphilis; specific fevers; heart disease; gout; mineral poisons (lead).

*Pathology.*—*Acute.*—Kidney swollen, bright red, later mottled; capsule non-adherent; epithelium of tubules and glomeruli undergo cloudy swelling, fatty degeneration. Urine scanty or suppressed, albuminous blood, hyaline, epithelium, casts.



FIG. 379.—Dilatation of the ureter due to calculous obstruction (Stengel).

*Chronic.*—(a) Parenchymatous: Kidney large, pale-yellow color (anemia, fatty degeneration); tubes filled with fatty and epithelial casts; overgrowth of connective tissue; later

organ shrinks; capsule somewhat adherent. Urine usually diminished, albuminous, hyaline, fatty, granular casts. (b) Interstitial: Kidney small, red; adherent capsule; overgrowth of connective tissue; arteriosclerosis of renal vessels (fatty degeneration of media, connective-tissue overgrowth of intima). Urine increased in quantity; pale color; low specific gravity (1005–1010); trace of albumin; few narrow, hyaline casts.

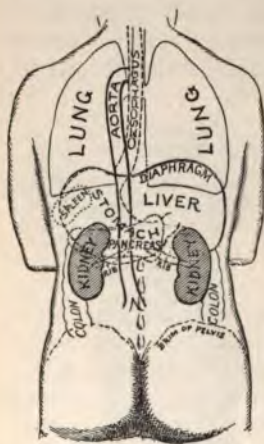


FIG. 380.—Diagram of the relations of kidney to viscera, spine, and surface points.

**Symptoms.**—*Acute:* Moderate fever; anemia; dull lumbar pain; nausea; vomiting; dropsy; uremia. *Chronic:* Loss of flesh and strength; anemia; dropsy (may be absent or appear late in interstitial form); hypertrophy of the heart; dyspnea; uremia.

**Treatment.**—*Acute:* Enforced rest (until albumin disappears from urine); milk diet; water; dry or wet cups; hot fomentation to loins; diaphoretics; salines.

*Chronic:* Improve hygiene; rest; salines.

R. Mass. hydrarg.,  
Pulv. digitalis,  
Pulv. scillæ . . . . . aa gr. xx (1.333 gm.).

M. et ft. pil. No. xx.

Sig.—One pill three times daily (for dropsy).

Stripping up or dissecting off the kidney capsule (incising through the convexity) has been carried out for the relief of these cases (constriction of the blood-vessels removed, the kidney does better work). The method, however, is still on trial.

**Prognosis.**—Guardedly favorable in acute; unfavorable in chronic.

**Pyelitis (Pyonephrosis; Pyelonephritis. — Definition.**—Inflammation of the pelvis of the kidney.

**Etiology.**—Exposure (rare); drugs (cantharides); pregnancy; infectious fevers; by extension (cystitis); new growths (cancer, tuberculosis, syphilis); calculus.

**Pathology.**—The mucous lining is red, swollen, covered with tenacious secretion (mucus, pus, blood, desquamated epithelium); dilatation (pus collection) may occur with extension to kidney substance.

**Symptoms.**—Pain; tenderness in back and loins; swelling; fever (hectic if pus present). Urine acid; turbid (pus, blood, epithelium, mucus).

**Treatment.**—Enforced rest; restricted diet (milk, butter-milk, broths); hot fomentations; salines.

**Operative.**—Aspiration; incision; drainage.

**Aspiration. — Implements.**—Scalpel, dissecting forceps, trocar and cannula, aspirator.

**Method.**—Local anesthesia; prepare surface as for aseptic operation; puncture after making small skin incision through most prominent part of swelling.

**Incision into the Pelvis of the Kidney (Pyelotomy).**—May be required for: (a) Evacuation of pus; (b) exploration.

**Implements.**—Scalpel, scissors, dissecting forceps, grooved director, probe, hemostats (6), retractors (sharp, dull), needles, aspirator.

**Method.**—General anesthesia; prepare surface as for aseptic operation; incision 4 inches long, parallel to twelfth rib, and 1 inch below it, beginning at a point from  $2\frac{1}{2}$  to 3 inches in front of the spines of the vertebra. Divide skin, superficial fascia, latissimus dorsi, external oblique, internal oblique, transversalis muscles, lumbar fascia; dissect and retract kidney fat; expose kidney; incise; margins of sacculated pelvis may be sutured to skin surface or drainage-tube inserted.

**Prognosis.**—Guarded.

**Hydronephrosis. — Definition.**—Dilatation of the pelves of the kidneys with accumulation of watery fluid.



**Etiology.**—Stricture (ureter, urethra); impacted calculus; tumors (by compression of ureter from without, occlusion of urinary passages when growing from with).

**Pathology.**—Distention of pelvis with atrophy of renal tissue. Fluid may be urinous or watery.

**Symptoms.**—Obscure until well-marked swelling appears in loin or abdomen; frequent urination; pain; tenderness; nausea, vomiting; headache; dryness of the skin; constipation; intermittent anuria; uremia.

**Diagnosis.**—Lumbar tumor; rounded or lobulated; dull on percussion; fluctuating; aspiration yields a clear fluid containing urea and uric acid.

**Treatment.**—Moderate distention treat expectantly; aspiration; pyelotomy with permanent drainage (renal fistula); incision into the kidney (nephrotomy); excision of the kidney (nephrectomy).

**Nephrotomy.**—*Definition.*—Incision into the kidney.

*Required For.*—Exploration; fluid collection (pus, water); renal calculus (lithonephrotomy).

*Implements.*—Scalpel, scissors, dissecting forceps, probe, grooved director, hemostats (8), retractors (dull, sharp-pointed); aspirator; needles.

*Method.*—General anesthesia; prepare surface as for aseptic operation (patient semiprone; make loin space prominent by double pillow); incision 4 inches long, commencing  $2\frac{1}{2}$  to 3 inches from the middle line of the back; divide skin, superficial fascia; cellular tissue; latissimus dorsi, external oblique, internal oblique, transversalis muscles; lumbar fascia; dissect and separate kidney fat; retract and expose kidney inclosed in its capsule; aspirate; incise; drain wound.

*Prognosis.*—Guarded.

**Nephrectomy.**—*Definition.*—Removal of a kidney.

*Implements.*—Scalpel, scissors, dissecting forceps, retractors (dull, sharp-pointed); hemostats (8), grooved director, probe, aspirator; needles.

*Required For.*—(a) Continued suppuration after operation for hydronephrosis; (b) chronic or metastatic; (c) malignant tumor (sarcoma).

*Method.*—Determine sufficient powers in opposite kidney by catheterization of ureters; general anesthesia; patient semiprone; make loin space prominent by pad or pillow; prepare surface as for aseptic operation; (a) lumbar incision, 3 to 4 inches (7.5–10 cm.) long, beginning at a point  $2\frac{1}{2}$  to 3 inches (6.25–7.5 cm.) from the middle of the back, extending parallel to the last rib and 1 inch (2.5 cm.) below it; (b) hockey-stick incision: divide skin, superficial fascia, latissimus dorsi, external oblique, internal oblique, transversalis muscles; lumbar fascia; dissect kidney fat; expose the capsule of kidney; (c) median: enucleate kidney from capsule (if adherent, dissect it free from the kidney fat); ligate, resect, curet, and cauterize ureter; ligate vessels (silk ligature); gauze-tube drain and packing.

*Dressing.*—Gauze, cotton, bandage.

*Prognosis.*—Guarded.

**Floating Kidney.**—*Definition.*—Unnaturally movable kidney. Right kidney is more often affected.

*Etiology.*—Female sex; early adult life; pregnancy; traumatism, debility after acute or chronic disease; fecal impaction.

*Pathology.*—Absence or absorption of the kidney fat, with elongation of the peritoneal attachments.

*Symptoms and Diagnosis.*—Sense of weight to marked pain and tenderness in lumbar, loin, hypochondriac regions; tumor movable, size and shape of kidney; no cachexia.

*Treatment.*—Improve the hygiene; laxatives; compress and bandage; abdominal elastic support, abdominal corset, acting so as to support the abdominal viscera; nephrorrhaphy. When a kidney becomes fixed in an abnormal situation, it is spoken of as being *dislocated*.

**Nephrorrhaphy (Nephropexy).**—*Definition.*—Anchoring by suturing or otherwise an abnormally movable kidney.

*Implements.*—Scalpel, scissors, dissecting forceps, hemostats (8), probe, grooved director, retractors (dull, sharp-pointed), needles.

*Method.*—General anesthesia; prepare surface as for aseptic operation; patient in semiprone position; make loin space prominent by cushion; incision 3 inches long, starting at a



point about 3 inches from the middle of the back, parallel to last rib and one inch below it; divide skin, superficial fascia, latissimus dorsi, external oblique, internal oblique, transversalis muscles; lumbar fascia; dissect kidney fat; expose kidney capsule; scarify capsule; anchor kidney by passing four to six silk sutures through capsule, including a portion of the kidney substance, to the lumbar muscles and fascia; close the wound or drain from lower end if fat is excessive.

*Dressing.*—Gauze, cotton, bandage.

*After-treatment.*—Avoid strain for six months.

*Prognosis.*—Guardedly favorable.

**Perinephritis.**—*Definition.*—Inflammation occurring in the cellular and connective tissue surrounding the kidney.

*Etiology.*—Traumatism; infection (remote or within the kidney); exposure.

*Symptoms.*—Pain, tenderness, fever.

*Diagnosis.*—From Pott's disease, hip-joint disease, by history and absence of deformity.

*Treatment.*—Enforced rest; hot fomentations, cups, leeching; salines; diuretics (milk, buttermilk, water); restricted diet. Opium and belladonna for relief of muscular spasm.

*Prognosis.*—Guarded; danger of abscess formation.

**Perinephritic Abscess.**—*Etiology.*—Perinephritis; by extension after lithotomy, castration, internal urethrotomy, prostatic abscess, appendicitis; empyema.

*Symptoms and Diagnosis.*—Pain, tenderness, hectic, swelling, edema; aspiration demonstrates pus.

*Treatment.*—Early incision, drainage; exploration of the kidney (aspiration, nephrotomy); secondary nephrectomy.

*Prognosis.*—Guarded.

**Nephralgia.**—*Definition.*—Neuralgia of the kidneys due to irritation (acid urine).

*Etiology.*—Male sex; middle life; overwork; diathesis.

*Symptoms and Diagnosis.*—Deep-seated pain and tenderness, centered in kidney and along ureters to groin or testicle. Urine upon examination scanty and high colored; marked acidity.

*Treatment.*—Restricted diet; diuretics (milk, buttermilk, free water-drinking, potassium citrate, potassium acetate);



alkalis, boric acid, gr. v-x four times daily; vichy; salines; improve hygiene.

**Prognosis.**—Favorable.

**Phosphaturia.**—**Definition.**—Excess of earthy phosphates in the urine by precipitation.

**Etiology.**—Predisposing causes: Early life, male sex, nervous temperament; overwork; wasting diseases.

**Pathology.**—Obscure; precipitation, with or without excess of earthy phosphates in presence of alkaline urine.

**Symptoms.**—Passage of varying quantities of pale to milk-like urine (may flow at end of each urination), made up of amorphous and crystalline phosphates.

**Diagnosis.**—*Cystitis*: Increased and painful urination (tenesmus); urine turbid, contains pus, blood, mucus, shreds; fever; retention of urine. *Spermatorrhea*: Rare disease; absence of spermatozoa.

**Treatment.**—Improve the hygiene; laxatives; acidify urine (acid. benzoic., gr. v-x—0.333–0.666 gm.—four times daily; acid. boric., gr. x—0.666 gm.—four times daily); tonics.

**Prognosis.**—Favorable.

**Oxaluria.**—**Definition.**—Continued excess of oxalates in the urine.

**Etiology.**—Early life, male sex, indolent habits, sexual excess, diatheses (gout, rheumatism, lithemia).

**Symptoms and Diagnosis.**—Nervous dyspepsia; hypochondriasis; neuralgic pains; presence of excess of oxalates in the urine upon examination.

**Pathology.**—Obscure; probably dependent upon disturbance of metabolism.

**Treatment.**—Rest; improve hygiene; restrict diet; laxatives; sodium phosphate, gr. x-xx (0.666–1.333 gm.) three times daily; tonics.

R. Strych. sulph. . . . . gr. j. (0.66 gm.).  
 Acid. nitromur. . . . . f $\frac{3}{4}$ ij (8 c.c.).  
 Tinc. cadamomi comp. . . . . f $\frac{3}{4}$ ij (96 c.c.).  
 Tinc. gentian. comp. . . . . f $\frac{3}{4}$ ij (96 c.c.).  
 Liq. pepsin. . . . . q. s. ad f $\frac{3}{4}$ vij (256 c.c.).

M. Sig. A dessertspoonful after meals.

**Prognosis.**—Generally favorable.

**Gravel.**—**Definition.**—Renal sand.

**Etiology.**—Male sex, middle life, sedentary occupations; diatheses (gout, rheumatism), insufficient water-drinking.

**Pathology.**—Separation of highly concentrated urine gives rise to deposition of urinary salts, as crystalline infarcts or amorphous powder.

**Symptoms and Diagnosis.**—Frequent urination; ardor urinæ; pain; tenderness; urine scanty, highly colored, with increased acidity.

**Treatment.**—Rest; improve hygiene; restrict diet (meats, sugars, alcohol); encourage water-drinking; milk, butter-milk; tonics.

**Prognosis.**—Guardedly favorable.

**Nephrolithiasis (Renal Calculus).**—**Definition.**—Stone in the kidney.

**Etiology.**—Male sex, extremes of life; sedentary occupations; residence in limestone countries; diatheses (rheumatism, gout).

**Pathology.**—Accumulation and gluing together of crystalline particles or amorphous powder, together with further deposition of urinary salines (may take place about blood-clot, mucus, ova of parasites, casts, epithelial shreds) gives rise to the formation of calculus.

According to shape may be: (*a*) Small gritty particles, gravel, renal sand; (*b*) dentritic, Y-shaped, coral calculi. Chemically, stones are—(*a*) Uric acid (most frequent form); (*b*) oxalate of lime (mulberry); (*c*) phosphatic; (*d*) cystin; (*e*) xanthin; (*f*) carbonate of lime; (*g*) indigo; (*h*) urostealith (rarest).

**Effects.**—(*a*) Stone may remain latent; (*b*) pass away, with or without symptoms of colic; (*c*) excite inflammation (pyelitis, perinephritis, abscess, perforation); (*d*) give rise to acute sepsis (systemic), pressure necrosis, and action of colon bacillus combined; (*e*) produce dilatation from obstruction (hydronephrosis, pyonephrosis).

**Symptoms and Diagnosis.**—Pain (sudden onset, starting in back, radiating down the ureter, penis, testicle, thigh); retraction of testicle upon affected side; pallor, cold, sweat, weak pulse, vomiting; attack may last few minutes to sev-



eral hours ; followed by passage of quantity of urine which may contain stone, pus, blood, epithelial shreds (from irritation or laceration). Presence detected sometimes by needling in various directions (when the kidney is exposed at the time of operation or it may be felt as a small pointed projection from a pyramid, the stone being concealed).

**Treatment.**—*Attack.*—Hot fomentations ; free water-drinking ; hypodermic injection of morphin, gr.  $\frac{1}{8}$ — $\frac{1}{4}$  (0.008—0.016 gm.), with atropin, gr.  $\frac{1}{150}$  (0.003 gm.), repeated at intervals of twenty minutes to half an hour until pain is controlled ; general anesthesia.

*Interval.*—Improve the hygiene ; mild diuretics (free water-drinking, milk, buttermilk, lithia (gr. v—0.333 gm.) four to eight times daily taken in a glass of water ; citrate of potassium (gr. v—0.333 gm.) ; when alkaline stone indicated, give acid. benzoic., gr. v (0.333 gm.) ; boric acid, gr. v—x (0.333—0.666 gm.) in water.

*Operative Treatment*—The teaching of some surgeons is that a stone should be removed as soon as the diagnosis is made. (1) Removal of the stone from—(a) Kidney (nephrotomy, nephrolithotomy) ; (b) pelvis (pyelotomy, pyelolithotomy) ; (c) ureter (ureterotomy, ureterolithotomy) ; (2) removal of affected kidney (nephrectomy).

Determine the power of the other kidney by quantitative testing for urea (if urea is normal in amount the other kidney is normal and you may operate).

**Prognosis.**—Guarded.

**Tuberculosis of the Kidney.**—Is usually secondary to affection of the bladder or prostate ; may be unilateral (localized pyelonephritis) ; bilateral (miliary).

**Symptoms and Diagnosis.** Frequent urination ; pain, tenderness ; cachexia ; history of tuberculosis in some other part ; hereditary taint. Urine contains pus, blood, tubercle bacilli, shreds, epithelium (kidney, pelvis, ureter, bladder).

**Treatment.**—Early : Rest ; tonics ; incision ; drainage. Late : Palliative (tonics and supportive).

**Prognosis.**—Unfavorable.



**New Growths; Cysts (Serous, Hydatid).**—May be congenital or acquired.

**Symptoms.**—Tumor gradually increasing in size; may fluctuate.

**Complications and Sequelæ.**—Hemorrhage; rupture and spontaneous discharge through the ureter; malignant change.

**Treatment.**—Repeated aspirations; incision (nephrotomy) with drainage.

**Prognosis.**—Guardedly favorable.

**Malformations (Anomalies).**—Important when considering nephrectomy.

Kidney may be single (usually enlarged, lobulated, and centrally placed in abdomen or pelvis), known as fused (horseshoe kidney); solitary kidney. Determine the condition from history, by physical examination, cystotomy.

**Wounds.**—May be: (a) Supraparietal (contusion to rupture and pulpification of kidney substance); (b) penetrating (extraperitoneal, through the loin space; intraperitoneal, through the abdominal parietes).

**Symptoms and Diagnosis.**—Shock, pain, tenderness, hematuria, extravasation of urine; history of injury.

**Treatment.**—Enforced rest; restricted diet (milk, broths, water); strapping chest as for fracture of ribs; move bowels by enemata (avoid purgation and vomiting, danger of exciting hemorrhage); gallic acid, opium, ergot (for hemorrhage); incision (nephrotomy) with drainage; nephrectomy.

**Prognosis.**—Always guarded.

## VAGINA.

**Vaginitis.**—**Definition.**—Inflammation of the vagina.

**Etiology.**—Traumatism (first or violent coitus, foreign bodies); irritating injections; want of cleanliness; violent exercises; gonorrhea; new growths.

**Symptoms.**—Pain, tenderness, discharge.

**Treatment.**—Rest; elevation of hips; irrigation with warm sterile water, boric acid, teaspoonful (4 gm.) to pint (512 c.c.) of water, silver nitrate, 1 : 2000; restricted diet (milk, buttermilk, broths); salines.

**Prognosis.**—Guardedly favorable.

**Vulvitis.**—**Definition.**—Inflammation of the vulva.

**Etiology.**—Traumatism; uncleanliness; vaginal discharge.

**Complications.**—Labial abscess.

**Symptoms.**—Redness, heat, swelling, pain, tenderness.

**Treatment.**—Rest; separation of parts (thin layer of absorbent cotton, frequently changed); irrigation with hot sterile water; boric-acid solution, teaspoonful (4 gm.) to pint (512 c.c.) of water; bichlorid, 1 : 5000; application silver nitrate (gr. v–xl to ounce of water); dusting-powder (calomel, bismuth subnitrate, oxid, or zinc); salines; incision and drainage for abscess formation.

**Varicose Veins of Vulva.**—**Etiology.**—Frequent pregnancies; tumor; constipation.

**Symptoms and Diagnosis.**—Sense of heat and irritation; presence of varicose tumor (olive to size of child's head).

**Complication.**—Hematuria of labium (subcutaneous rupture of varicose veins occurs during labor or after falls or blows).

**Treatment.**—Compress and elastic abdominal and perineal support; excision with ligation.

**Prognosis.**—Favorable.

**Pruritus Vulvæ.**—**Definition.**—Symptom rather than a disease, characterized by irritation of nerves of vulva, vagina, anus, skin of abdomen, thighs.

Itching first relieved by scratching, later increases the trouble, causing eruption, exudation, crusting.

**Etiology.**—Leukorrhea (endometritis, cancer); diathesis; gout; eczema; pregnancy; idiopathic in debilitated.

**Treatment.**—Treat the cause; apply locally:

R. Mercury bichlorid . . . . . gr. j (0.066 gm.).

Emulsion bitter almonds . . . . . gr. j (0.066 gm.).

Water . . . . . f $\frac{3}{4}$ j (32 c.c.).

M. Sig.—Apply twice daily after drying the parts.

Carbolic acid, 10 to 20 per cent.; apply twice daily; iodoform in ether; silver nitrate (20 to 60 per cent.); excision of diseased skin.

**Prognosis.**—Guarded.

**Hyperesthesia of the Vulva.**—**Definition.**—Super-

sensitiveness of the vulva, unassociated with pruritus or inflammatory reaction.

**Etiology.**—Obscure; senile change in mucous membrane may be accountable. Occurs most often in debilitated women at time of menopause.

**Treatment.**—Rest; change of scene; improve hygiene; tonics; dissection of sensitive mucocutaneous surface; application of nitric acid (cocain anesthesia).

**Prognosis.**—Guardedly unfavorable.

**Vaginismus.**—**Definition.**—Spasm of the sphincter vaginae muscle.

**Etiology.**—Rigid hymen; fissures, ulceration; hysteria; tumors; rectal disturbance (piles, fistula, fissure).

**Symptoms.**—Firm, spasmodic contraction of vagina upon attempts at coitus or slightest external irritation; pain.

**Treatment.**—Remove the cause; dilatation of sphincter.

**Prognosis.**—Favorable.

**New Growths.**—**Cysts; Papilloma; Hypertrophy (Clitoris; Labia); Cancer (Epithelioma); Vascular (Urethral Caruncle; Papillary Polypoid Angioma).**

—**Treatment.**—Excision.

**Prognosis.**—Guarded.

**Malformations (Imperforate Vagina; Imperforate Vulva; Imperforate Hymen).**—**Etiology.**—Congenital malformation; adhesion after ulceration.

**Treatment.**—Dilatation; dissection.

**Prognosis.**—Guarded.

**Fistulae.**—I. *Urinary.*—(a) Vesicovaginal (vesicovaginal septum perforated); (b) urethrovaginal (perforation through urethra); (c) vesicocervical (through anterior wall of cervix); (d) ureterovaginal (perforation between ureter and vagina); (e) ureterocervical (connection between ureter and cervical canal).

2. *Fecal.*—(a) Rectovaginal (connection between rectum and vagina).

**Etiology.**—Traumatism (difficult labor, instrumental deliveries); calculus.

**Pathology.**—Inflammation; ulceration following compression rupture.



**Symptoms.**—Incontinence; may appear at once or weeks after injury.

**Treatment.**—Plastic operation (denudation, suture).

**Prognosis.**—Favorable; repeated operations may be necessary.

#### PERINEUM.

**Lacerations.**—(1) Involving the perineal body; (2) involving the muscular attachments to the perineal body.

**Etiology.**—Traumatism (difficult or precipitate labor, instrumental deliveries).

**Symptoms and Diagnosis.**—Dragging pain; sense of loss of support (recumbency gives relief); examination; early, reveals fresh tear; later, scar tissue obscured; prolapse (rectocele, rolling outward of posterior vaginal wall); cystocele (protrusion of anterior vaginal wall).

**Treatment.**—Plastic operation.

**Perineorrhaphy.**—*Definition.*—Operation for closure or restoration of a torn perineum.

*Implements.*—Scissors, dissecting forceps, hemostats (6), speculum, needles, retractors (sharp-pointed).

*Method.*—General anesthesia (no anesthesia required if the operation be performed within twenty-four hours after labor); prepare patient by vaginal douching; purgation; patient in lithotomy or Sims' position; freshen the edges or suture direct.

*Dressing.*—Gauze, perineal binder.

*Prognosis.*—Guardedly favorable.

#### UTERUS.

**Endometritis.**—*Definition.*—Inflammation of lining mucous membrane of the uterus.

May be: (1) Acute; (2) chronic—(a) cervical (cervical catarrh confined to cervical canal, commonest variety); (b) general; (c) corporeal (affecting body of the uterus).

**Etiology.**—*Acute.*—Traumatism; sepsis; infectious fevers; gonorrhea; sudden suppression of menstruation (cold).

*Chronic.*—Constitutional disease; diathesis; frequent

pregnancies; prolonged lactation; abortion; uterine displacements; traumatism during confinement; gonorrhea.

**Symptoms and Diagnosis.**—Dull aching pain; dragging sensation within pelvis and back; tenderness (hypogastrium); rectal and bladder tenesmus; fever (septic); discharge (leukorrhea may be slight and serous; profuse, containing mucus, blood, pus); by examination external os patulous, internal os non-dilated in chronic form; cervix red, swollen, edematous; uterus tender, slightly enlarged, softened.

**Treatment.**—*Acute.*—Treat the cause; rest in bed (elevation of hips); salines; suppositories of opium and belladonna (for pain); hot fomentations; vaginal irrigations of hot water; stimulants.

*Chronic.*—Treat the cause (correct displacements); tonics (iron, strychnin, quinin):

R.	Hydrarg. chlor. corros. . . . .	gr. j-ij (0.066-0.133 gm.).
	Liq. arsen. chlor. . . . .	gtt. xlvij (3.532 c.c.).
	Tinct. ferri chlor. . . . .	f℥iv (16 c.c.).
	Acid. hydrochlor. . . . .	f℥iv (16 c.c.).
	Syrupi . . . . .	f℥ij (96 c.c.).
	Aquæ . . . . .	ad f℥vj (192 c.c.).

M. Sig.—One or two teaspoonfuls (4-8 c.c.) after meals in water.

Check secretion by fluid extract of ergot, 5-10 drops (0.333-0.666 c.c.), four times daily; fluid extract of hydrastis canadensis, 20 drops (1.333 c.c.), three or four times daily, to decrease secretion; bromids reduce nervous sensibility; vaginal irrigations of hot water; local application to vaginal vault and cervix of tincture of iodine, Churchill's tincture—iodine, gr. xxxvj (2.399 gm.); potassium iodide, gr. xlvij (3.532 gm.); alcohol, f℥j (32 c.c.). Follow application with cotton tampon soaked in—(a) Boroglycerid—boric acid ℥iv (16 gm.), glycerin, f℥j (32 c.c.); (b) glycerid of tannin—tannin ℥ij (8 gm.), glycerin, f℥j (32 c.c.); remove the tampon at the end of from twelve to twenty-four hours; follow with hot-water irrigation; application to cervical canal of zinc sulphate gr. j-ij (0.066-0.133 gm.) to an ounce (32 c.c.) of water, nitrate of silver, chlorid of zinc, tannic acid (one to two grains to an ounce (32 c.c.) of water), carbolic acid, 1 per

cent. Cervical canal instillations may be made at intervals of from five to seven days; curettage, scarification (edematous condition); removal of uterus (may be required in acute virulent septic endometritis).

**Prognosis.**—Guarded.

**Metritis.**—**Definition.**—Inflammation of the body of the uterus.

**Etiology.**—Displacements, pregnancy, morbid growth, abortion.

**Treatment.**—Treat the cause; hysterectomy.

**Prognosis.**—Guarded.

**Lacerations of Cervix.**—**Etiology.**—Childbirth.

**Varieties.**—(a) Through anterior or posterior lips, (b) unilateral or bilateral; (c) stellate; (d) incomplete (vaginal portion of cervix not involved).

**Diagnosis.**—Examination demonstrates eversion of cervical head and uterine mucous membrane occurs (erosion, ectropion, catarrhal patch).

**Results of Laceration.**—Endometritis; hypertrophy of cervix; ovaritis; cancer (epithelioma); menorrhagia; uterine displacement; sterility (due to acrid discharge).

**Treatment.**—Plastic operation (trachelorrhaphy).

**Trachelorrhaphy.**—**Definition.**—Repair of a lacerated cervix. Contraindicated in presence of pelvic cellulitis or tubal disease.

**Implements.**—Scissors, tenacula, vulsellum forceps, bistoury, needles, speculum, dissecting forceps, needle-holder.

**Preparatory Treatment.**—Hot-water irrigations; applications of Churchill's tincture of iodine to cervix and vaginal vault; glycerin tampons; puncture cervix to relieve congestion, and cystic collections.

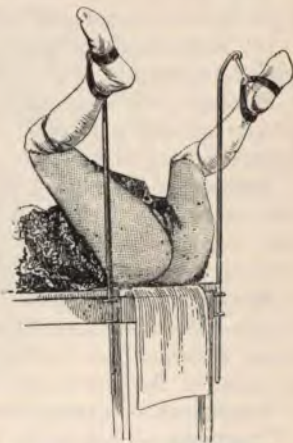


FIG. 381.—Edebohls' dorsal posture.



*Method.*—General anesthesia; patient in dorsal or Sims' position (Fig. 381); draw down cervix with tenaculum or vulsellum; denude surfaces, leaving narrow strip of mucous tissue intact for formation of new cervical canal (Emmet's method). Convert incomplete lacerations into complete before operating. Multiple lacerations may be converted into bilateral by excising projections, or may treat at separate operations.

*Prognosis.*—Guardedly favorable.

#### FLEXIONS AND DISPLACEMENTS.

**Flexions.**—**Definition.**—Lesion of form.

May be: (a) Anteflexion (form of bending); not pathologic unless symptoms arise.

(b) Retroflexion (backward bending), usually associated with retroversion.

**Etiology.**—Congenital; constipation; tight clothing; improper sitting postures; inflammation, degenerative disease (cancer), irregular involution after childbirth.

**Pathology.**—Bending occurs at junction of body and cervix (uterine walls thinnest here). Occlusion of os; retention and derangement of function (sterility); tendency toward endometritis.

**Symptoms and Diagnosis.**—Painful menstruation (dysmenorrhea)—pain intermittent, worse before establishment of flow; upon examination fundus found markedly anterior; sulcus at point of flexion to be felt in anterior vaginal wall.

**Treatment.**—Introduction of sound (twice weekly).

**Prognosis.**—Guardedly favorable.

**Retroversion; Prolapse.**—**Definition.**—Lesion of position.

**Version.**—May be: (a) *Anteversio* (uterus too far forward); not a disease, but a complication of other uterine conditions (consists in a straightening of the uterine axis—cervix points backward).

**Etiology.**—Chronic inflammation about the uterus.

**Diagnosis.**—By examination cervix is found pointing backward; absence of normal curvature; fundus forward.

**Treatment.**—Treat the cause.

(b) *Retroversion* (change in uterine axis, in which the fundus points toward the sacrum, cervix toward pubis or vulva). Occurs physiologically when bladder is full.

**Etiology.**—Childbirth; traumatism; congenital.

**Symptoms.**—Backache; pain; rectal and vesical tenesmus; symptoms relieved by recumbent posture; dysmenorrhea (not acute); sterility may be present.

**Diagnosis.**—Upon examination fundus found backward, cervix points forward; note sharp angle of bending (retroflexion).

**Treatment.**—Replacement; pessary; shortening the round



FIG. 382.—Complete prolapse of the uterus (Penrose).

ligaments through the inguinal canal (Alexander's operation); ventrofixation (abdominal hysteropexy), suturing posterior portion of fundus to anterior abdominal wall.

**Prognosis.**—Guardedly favorable.

**Prolapse (Falling of the Womb).**—**Definition.**—Sinking of uterus below normal level. When pushed bodily forward (anteposed), displaced bodily backward (retroposed) (Fig. 382).

Prolapse may be: Complete (procidentia), uterus entirely

outside body; incomplete (uterus partially or completely in vagina).

**Etiology.**—Increased weight of uterus (tumor, subinvolution); loss of support (vaginal walls, bladder, rectum); senile change; strain; compression of clothing; childbirth. Rectal and vesical tenesmus relieved by recumbent position; increased by walking, lifting, coughing.

**Diagnosis.**—Upon examination cervix resting upon floor of vagina; body of uterus rests upon rectum (elongation of cervix, hypertrophic elongation of supravaginal portion of the cervix); when prolapse complete, pear-like tumor presents at vulva; uterine sound shows a length of from four to eight inches from os to fundus.

**Treatment.**—Replace; retain by pessary, perineal pad and binder, suturing uterus to abdominal wall (hysteropexy); removal of uterus (hysterectomy); suture a portion of anterior and posterior vaginal wall together after denuding (form a band of support—LeFort's operation).

**Prognosis.**—Guardedly favorable.

**Hypertrophy of Infravaginal Portion of Cervix.**—

Consists in an elongation of cervix into vagina; uterine body normal as to size and position.

**Etiology.**—Unknown.

**Symptoms.**—Pelvic tenesmus; leukorrhea; dysmenorrhea; vaginal ulceration may occur.

**Treatment.**—Amputation of hypertrophied cervix by removal of wedge-shaped flaps after internal splitting. Control bleeding by elastic ligature; allow one-quarter of an inch length of flaps for contraction.

**Prognosis.**—Guardedly favorable.

**New Growths (Fibroid Tumor; Bleeding Disease of the Uterus).**—Occurs as: (a) Interstitial, intramural (confined to muscular coat); (b) subperitoneal (Fig. 383); (outward growth, apt to be pedunculated); (c) submucous (growth directed toward the uterine cavity).

**Pathology.**—Originates from muscular coat (may be myoma, fibromyoma); encapsulated; firm consistence; pale; growth slow; varies in size and number; menopause delayed; tumor undergoes atrophic change at this time.



**Symptoms.**—Irregular bleeding (menorrhagia); painful menstruation (dysmenorrhea); leukorrhea; sterility; abortion.

**Complications and Sequelæ.**—Fatty, cystic, colloid, myxomatous degeneration; calcification; edema; suppuration; gangrene; malignant change.

**Treatment.**—When in doubt of diagnosis wait. Palliative when operation refused; treat the hemorrhage (ergot, gallic acid, potassium bromid, gr. xx-xxx, four to six times daily); tonics; rest; improve hygiene; avoid sexual intercourse.

**Operative Treatment.**—Indications: Persistent bleeding; pressure symptoms; when degeneration (cystic) occurs; intraligamentous growth. Operation; remove tumor through abdomen or vagina; removal of uterus (hysterectomy); production of premature menopause (castration, Tait's, Battey's operation).

**Implements.**—Scalpel, scissors, dissecting forceps, tenaculum, vulsellum forceps, retractors (sharp-pointed, dull), hemostats (12), speculum, sound (uterine), needles, elastic ligature, mattress-pins, aneurysm needle.

**Myomectomy.**—*Definition.*—Removal of tumor.

*Method.*—(a) Through vagina: General anesthesia; draw tumor downward; excise after twisting pedicle. Control hemorrhage by tampon, hot-water injections; ergot. (b) Abdominal section: Incise capsule; shell out tumor; close wound in uterine wall; close abdominal wound.

*Prognosis.*—Guardedly favorable.

**Hysterectomy.**—*Definition.*—Removal of the uterus.

*Method.*—(a) *By way of vagina* (colpohysterectomy): General anesthesia; patient in lithotomy position; draw down cervix; incise posteriorly through cul-de-sac; retract open-

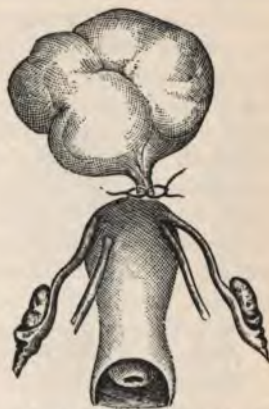


FIG. 383.—Pedunculated subperitoneal fibroid (Hofmeyer).

ing and ligate uterine arteries by suturing ligatures; incise vesico-uterine pouch; complete the dissection; prevent vaginal prolapse by suturing margins of vaginal walls to stump of ligament; control hemorrhage by clamp, suturing ligatures; drain.

*Dressing.*—Gauze pack.

(b) *Abdominal hysterectomy* (supravaginal hysterectomy): General anesthesia; patient in dorsal position; prepare the surface as for an aseptic operation; incision, median between umbilicus and symphysis pubis; open the peritoneum; draw tumor forward (dissect adhesions); ligate ovarian arteries (uterine and pelvic sides by double ligatures); ligate uterus and tumor mass by elastic ligature; excise; pass two mattress-pins through stump to hold in position (extraperitoneal method); suture peritoneum around stump of cervix; close abdominal incision above and below anchored stump (intra-peritoneal method); double ligatures to ovarian arteries; divide broad ligaments; ligate uterine arteries at level of internal os within broad ligament; dissect the uterus at the level of the internal os, unite stump in wedge-shaped flaps; close peritoneum; close abdominal wound.

*Prognosis.*—Guardedly favorable.

*Castration.*—*Method.*—General anesthesia; patient in dorsal position; prepare surface as for aseptic operation; median incision 2 to 3 inches (5–7.5 cm.) long, midway between umbilicus and symphysis; open peritoneum; retract; expose tube and ovary from behind the broad ligament; ligate tube and broad ligament; excise; repeat upon opposite side; close wound or drain.

*Prognosis.*—Guardedly favorable.

**Malignant Growth.**—(a) **Carcinoma (Epithelioma).**—(Fig. 384).

*Etiology.*—Heredity; middle life; frequent pregnancies with lacerations.

*Symptoms.*—Irregular bleeding, pain, offensive discharge.

*Pathology.*—Carcinoma begins as hard nodules beneath the mucous lining of cervix; growth extends upward into body of uterus, downward into the vagina, pelvic glandular tissue, ureters, and kidney.



(b) **Sarcoma, Recurrent Fibroids**: Occur most often in body of uterus; knobby projections of pulpy, brain-like appearance, with round-cell infiltration, or may be of firm consistence.

*Symptoms.*—Hemorrhage; watery, non-offensive discharge, no pain.

*Diagnosis.*—Digital and microscopic examination.

*Treatment.*—Early; hysterectomy.

*Palliative.*—Curettement with cauterization (nitric acid, cautery).

*Prognosis.*—Unfavorable.

**Curettement (Curettage).**—

*Definition.*—Scraping the uterine cavity.

*Required For.*—Endometritis; sepsis (childbirth; abortion).

*Implements.*—Sharp and dull curets; uterine sounds; applicator; syringe; irrigator; dilators.

*Method.*—General anesthesia usually required; patient in dorsal or lithotomy position; irrigate and cleanse vagina; cleanse cervical canal by antiseptic cotton pledgets or application of iodine; determine course and length of cervical canal; dilate if necessary (size of thumb); curet systematically; irrigate; light gauze drain and pack.

**Cesarean Section.**—*Definition.*—Delivery of fetus by abdominal and uterine incision.

*Implements.*—Scalpel, scissors, dissecting forceps, retractors (dull, sharp-pointed), needles, hemostats (8), Esmarch tube.



FIG. 384.—Carcinoma of the uterine mucous membrane, diffuse form (after Pozzi).



**Method.**—General anesthesia; patient in dorsal position; prepare surface as for aseptic operation; expose uterus by median incision (abdominal incision should extend one-third above to two-thirds below umbilicus); apply Esmarch bandage to cervix; incise uterus (longitudinally, sufficient to allow escape of child's head); deliver child; placenta; suture uterus or perform hysterectomy; close abdominal wound.

**Symphysiotomy.**—**Definition.**—Subcutaneous division of pubic joint to further delivery of fetus.

**Implements.**—Scalpel, scissors, dissecting forceps, retractors (sharp-pointed, dull), hemostats (6), Gigli saw, catheter.

**Method.**—General anesthesia; prepare surface as for aseptic operation; patient in dorsal position; median incision, 1 inch (2.5 cm.) long upon the lower abdomen, extending to  $\frac{3}{4}$  inch (1.87 cm.) above the symphysis; retract; separate insertion of rectus muscles; separate symphysis with saw or symphysiotomy knife; avoid injury to bladder or urethra by passing a catheter as a guide; separate pubes (up to three inches); deliver child; wire symphysis, or apply broad adhesive straps after closing wound of soft parts.

#### BROAD LIGAMENTS.

**Pelvic Cellulitis Parametritis; Pelvic Peritonitis.**—**Definition.**—Inflammation of the cellular tissue between the two layers of the broad ligament.

**Etiology.**—Traumatism, endometritis, salpingitis, ovaritis.

**Symptoms.**—Pelvic tenesmus (bladder, rectum); pain (dragging, sense of weight); tenderness; fever.

**Treatment.**—Rest; hot fomentations; hot vaginal irrigations; salines; incision and drainage through posterior cul-de-sac if suppuration threatens.

**Prognosis.**—Guarded.

**Pelvic Hematocele.**—**Etiology.**—Traumatism; hemorrhage from ruptured tubal gestation, varicose veins of broad ligament; after operation.

May be: (a) Effusion into the peritoneal cavity (intra-peritoneal hematocele); (b) between the layers of the broad ligament (hematoma of the broad ligament).

**Treatment.**—Expectant unless decided symptoms arise, when abdominal section or reopening of wound is indicated.

**Prognosis.**—Guarded.

### FALLOPIAN TUBES.

**Salpingitis.**—**Definition.**—Inflammation of the mucous lining of the tubes. May be unilateral or bilateral.

**Etiology.**—Extension from septic endometritis (labor, abortion); gonorrhea.

**Pathology.**—Early: Tubal tissues softened, swollen, friable; mucosa covered with mucopus (simple or catarrhal salpingitis); later, abdominal ostium closes—(a) salpingitis with occlusion but without distention of tube; (b) cystic distention (pyosalpinx—purulent contents: hydrosalpinx—later



FIG. 385.—Hydrosalpinx, showing complete inversion of the fimbriæ (Penrose).

stage, pus becomes sterile and watery (Fig. 385); hematosalpinx—bloody (Fig. 386).

**Symptoms.**—*Acute*: Unilateral or bilateral pain and tenderness; fever; fulness in vaginal fornices and posterior cul-de-sac; uterus, bound by adhesions, may be displaced. *Chronic*: Constant pain (unilateral or bilateral) referred to ovarian regions; dysmenorrhea; menorrhagia; recurrent attacks of pelvic cellulitis; sterility. Presence of sausage-shaped tumors (cystic tubes) or firm, cord-like condition.

**Treatment.**—First attack: Expectant; rest in bed two weeks; hot vaginal douches; salines; no opium if avoidable. Some cases recover without treatment. Operation: Castra-



FIG. 386.—Chronic salpingitis; both Fallopian tubes are closed and adherent (Penrose).

tion; required—(a) If no improvement; (b) abscess formation; (a) recurrent attacks.

**Prognosis.**—Guardedly favorable.

### OVARIES.

**Ovaritis.**—**Definition.**—Inflammation of the ovaries (Fig. 387).



FIG. 387.—Chronic oöphoritis: *a, a*, Corpus luteum changed into cyst; *b, b*, yellow masses with remnant of central cavity; *c, c*, corpora nigra; *d*, albuginea (natural size).

**Etiology.**—Traumatism; by extension.

**Symptoms.**—Pain; tenderness; fever.



**Treatment.**—Rest; elevation of hips; hot fomentations; salines; gelsemium (for pain).

**Prognosis.**—Guarded.

**New Growths.**—**Cysts of Ovary.**—(a) oöphoron: multiple (simple, glandular, or adenomatous); dermoid. (b) Paraoöphoron: papillary.

**Cysts of Parovarium.**—(a) Parovarian cysts (simple, papillary) (Fig. 388).

**Etiology.**—Unknown.

**Symptoms.**—Rapidly enlarging (Figs. 389, 390), painless tumor commencing in one groin; emaciation follows from bulk, pinched expression (ovarian countenance).

**Diagnosis.**—**Pregnancy.**—Associated signs: fulness of breasts; amenorrhea.

**Fibroid Tumor.**—Menorrhagia; slow growth; attachment to uterus; increased length of uterine canal.

**Phantom Tumor.**—Spurious pregnancy: Universal resonance; intestinal gurgling; tumor disappears upon firm pressure (distracting patient's attention or under general anesthesia); history (female married late in life; illegitimate intercourse).

**Treatment.**—Palliative (tapping; radical; laparotomy with removal).

**Prognosis.**—Guardedly favorable.

**Solid Tumors.**—May be: (a) Fibroma (rare); (b) myoma; (c) sarcoma; (d) carcinoma.

**Treatment.**—Laparotomy with removal.

**Prognosis.**—Favorable in benign; unfavorable in malignant.

**Displacements of Ovary.**—(a) **Hernia.**—**Definition.**—Entrance of ovary into the inguinal canal (rare). May prove to be undescended testicle. May be congenital or acquired.



FIG. 388.—Unilocular parovarian cyst of the broad ligament. To the left and above is the incised ovary, which is seen to be free. The elongated Fallopian tube is spread over the surface of the cyst (after Doran).

*Symptoms.*—Nauseating tenderness upon pressure; tumor increases in size just before menstrual periods.



FIG. 389.—Lateral view of abdomen affected with ovarian cyst (Albert).

*Treatment.*—Reduction with retention by truss; excision.

(b) **Prolapse.**—*Definition.*—Displacement downward of the ovary without displacement of the uterus.

*Etiology.*—Traumatism; increased weight (tumor, cyst, congestion).

*Symptoms and Diagnosis.*—Pain, increased upon motion (walking, defecation, coition—dyspareunia); presence of tumor behind cervix (bilateral if both ovaries are prolapsed).

*Treatment.*—Palliative; replacement; hot-water vaginal irrigations; application to the vault of the vagina of Churchill's tincture of iodine; glycerol tampons.

Radical operation—castration (ovariotomy) indicated when pain is intense; mental

derangement accompanying; in working women.

**Results of Castration.**—Menstruation disappears by

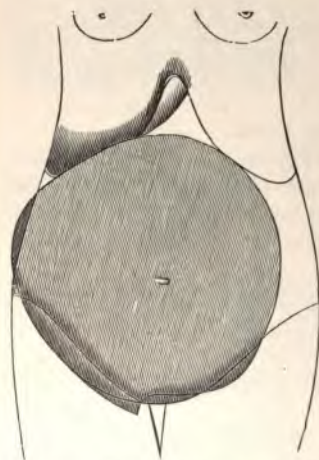


FIG. 390.—Area of dulness (shaded) in ovarian cystoma (Barnes).

end of two or three periods; nervous phenomena similar to those occurring at menopause (heat-flashes, flushes); sexual appetite may be unchanged or increased; disappears in a few cases.

### STERILITY.

**Definition.**—Incapacity of the male to fecundate the female or of the female to be impregnated.

**Etiology.**—Male at fault in 20 per cent. of sterile marriages. Due to: Absence of spermatozoa or dead when emitted (azoöpermism); undescended testicle; gonorrhea (double epididymitis); chronic alcoholism; physiologic before puberty and in old age; after long illness (tuberculosis); tumor; traumatism; stricture.

**Diagnosis.**—Microscopic examination of emission. Female: Due to gonorrhea; metritis; leukorrhea; endometritis; salpingitis; chronic ovarian cysts; tumors (malignant, benign); fibroids, conic cervix; laceration of cervix; displacements of uterus.

**Treatment.**—Improve hygiene; rest; tonics; injection of seminal fluid within the uterine cavity; treat the cause.

**Prognosis.**—Guarded.

**Impotence.**—**Definition.**—Inability properly to perform the sexual act.

**Etiology.**—Male—Malformation of penis; disparity in size of male and female organs; traumatism; constitutional disease (spinal neuroses); oxaluria; stricture; fear; over-excitement (pseudo-impotence).

*Female.*—Rigid or imperforate hymen; vaginismus; sexual frigidity from adherent clitoris; obesity; tumor.

**Treatment.**—Remove the cause.

**Prognosis.**—Favorable in pseudo-impotence; guarded in other forms.

**Atonic Impotence.**—**Definition.**—Temporary loss of sexual power following prolonged sexual excess.

**Symptoms.**—Inability to copulate; frequent nocturnal pollutions.

**Treatment.**—Rest (stop all attempts at intercourse); steel sounds (full sized) alternating with deep injection of silver



nitrate ( $\frac{1}{2}$  to 2 per cent.) when the prostate is involved; hot-water irrigation.

R. Potass. bromid. . . . .  $\bar{\text{S}}\text{ij}$  (96 gm.).  
 Tinct. gelsemium . . . . .  $\text{f}\bar{\text{S}}\text{ij}$  (8 c.c.).  
 Tinct. hyoscyamus . . . . .  $\text{f}\bar{\text{S}}\text{vj}$  (24 c.c.).  
 Aq. camph. . . . . q. s. ad  $\text{f}\bar{\text{S}}\text{vj}$  (192 c.c.).

M. Sig.—Tablespoonful night and morning.

Special sexual stimulant:

R. Damiana . . . . . gr.  $\bar{\text{S}}\text{j}$  (4 gm.).  
 Phosphorus . . . . . gr.  $\frac{1}{2}$  (0.008 gm.).  
 Nux vomica (ext.) . . . . . gr.  $\frac{2}{3}$  (0.044 gm.).

M. et ft. pil. No. xii.

Sig.—One pill two or three times daily.

*Prognosis.*—Favorable.

**Nocturnal Emission (Night-loss; Wet Dream).**

—**Definition.**—Seminal discharge occurring during sleep or early waking hours, usually accompanied by erotic fancy.

**Etiology.**—Physiologic; idiopathic; symptomatic (lesions of deep urethra).

**Physiology and Pathology.**—May occur normally once or twice a week in healthy, unmarried, continent males (idiopathic after masturbation). Emissions due to a paresis left after overstimulation of the sexual centers.

**Treatment.**—Sexual hygiene (light bed-clothing; hard mattress; cool room; urination upon retiring; knotted towel in small of the back; alarm-clock set for half an hour before usual time of emission (patient to get up and urinate); avoid constipation and discussions upon sexual subjects; hot- and cold-water douches to the perineum night and morning; rub down with coarse towel; systematic calisthenics before retiring until thoroughly tired.

R. Potass. bromid. . . . .  $\bar{\text{S}}\text{ij}$  (12 gm.).  
 Tinct. gelsemium . . . . .  $\text{f}\bar{\text{S}}\text{ij}$  (8 c.c.).  
 Tinct. hyoscyamus . . . . .  $\text{f}\bar{\text{S}}\text{vj}$  (24 c.c.).  
 Aq. camph. . . . . q. s. ad  $\text{f}\bar{\text{S}}\text{vj}$  (128 c.c.).

M. Sig.—One to four teaspoonfuls (4–16 c.c.) night and morning.

No local treatment during early stage (direct thoughts away from penis); after two or three weeks, if emissions have not decreased, pass full-sized sound every three or four

days (reduce sensitiveness of deep urethra); when the emissions have been reduced to once a week (under treatment), stop sounds.

R. Strychnin. sulph. . . . . gr.  $\frac{1}{4}$  (0.016 gm.).  
 Acid. phosphoric. (dil.) . . . . . f $\overline{3}$ j (32 c.c.).  
 Wine of cocoa, . . . . . q. s. ad. f $\overline{3}$ vj (192 c.c.).

M. Sig.—One tablespoonful after each meal.

**Prognosis.**—Favorable.

**Spermatorrhea.**—**Definition.**—Involuntary seminal emissions occurring both day and night, unaccompanied by erections (a rare disease).

**Etiology.**—Traumatism; disease of cerebrospinal axis.

**Symptoms.**—Continuous loss of spermatic fluid; spermatozoa ill-formed, few in number, non-motile.

**Diagnosis.**—Prostatorrhea (excessive secretion of prostatic fluid, physiologic after sexual excitement without ejaculation). History, examination of the discharge (glairy, like glycerin); absence of spermatozoa.

**Treatment.**—Improve the hygiene; tonics; sounds once or twice a week for local stimulation, alternating with deep injections of silver nitrate ( $\frac{1}{4}$  to 10 per cent.); hyoscin hydrobromate, gr.  $\frac{1}{200}$ — $\frac{1}{100}$  (0.0006 gm.).

R. Potass. bromid. . . . . ʒiij (12 gm.).  
 Tinct. gelsemium . . . . . f $\overline{3}$ ij (8 c.c.).  
 Tinct. hyoscyamus . . . . . f $\overline{3}$ vj (24 c.c.).  
 Aq. camp. . . . . q. s. ad. f $\overline{3}$ vj (192 c.c.).

M. Sig.—One tablespoonful night and morning.

**Prognosis.**—Unfavorable.

Where phosphaturia or oxaluria is encountered:

R. Nitromuriatic acid (strong) . . . . . f $\overline{3}$ ij (8 c.c.).  
 Tinct. nux vomic. . . . . f $\overline{3}$ iv (16 c.c.).  
 Tinct. cin. comp. . . . . q. s. ad. f $\overline{3}$ ij (192 c.c.).

M. Sig.—One teaspoonful after each meal.

### SEXUAL PERVERSION.

**Definition.**—Gratification of an individual either by thought or action as a substitute for normal sexual intercourse.

**Morphology.**—(a) Urnings (those who have sexual inclination toward persons of the same sex); pederasty (occurring in males); tribadism, Lesbian love (when in females). (b) Sadism (sexual inclination toward persons of the opposite sex, with perverse activity of the instinct). (c) Masochism (the association of passively endured cruelty and violence during sexual gratification). (d) Perverse sexual crimes (indecent exposure); violation (rape); lust-murder; incest; necrophilia. Fetichism (unnatural association of lust in the male with certain portions of the female form or dress). Acute uncontrollable sexual storms occur as satyriasis, when in males; nymphomania, uteromania, in females.

**Etiology.**—Heredity (mental deterioration, epilepsy; hysteria), sexual excess, fear of pregnancy, discord in marriage, alcohol, senility, early manifestation of paresis, lack of proper moral training in the young.

**Pathology.**—General signs of degeneration (intelligence, features, figure) may or may not be apparent; brain lesions (asymmetry) may be noted; sexual organs may be enlarged (rarely) or decreased in size, as the mouse-headed glans in the active male pederast; funnel-shaped and relaxed, smooth surfaced rectum in the passive pederast; scars (flagellation, vampirism).

**Diagnosis.**—The question of the presence of sexual perversion will arise most often in medicolegal matters and may be verified by observation (guarded). It will oftentimes be necessary to win the confidence of the individual.

**Treatment.**—Improve the hygiene, guard the moral training of those predisposed. Hypnotism has been claimed to have been most serviceable.

**Prognosis.**—Guarded.



CHAPTER XXIV.  
SURGERY OF THE EYE.

EYELIDS.

**Inflammation (Blepharitis Ciliaris; Blepharitis Marginalis).**—**Definition.**—Chronic inflammation of the edges of the eyelids (Fig. 391, 392), characterized by loss of eyelashes, thickening (tylosis) and reddening of the lids, with accumulation of secretion by crusting.



FIG. 391.—Position of hands in the act of everting the eyelid (de Schweinitz).

**Etiology.**—Ametropia (astigmatism, hypermetropia).

**Treatment.**—Rest, tonics, correction of refraction. Local: Remove crusts by hot water compresses, hydrogen dioxid (10 to 30 per cent.); apply ammoniated chlorate of mercury, red or yellow precipitate, 2 grains (0.133 gm.) to a dram (4 gm.) of lanolin or vaselin; nitrate of silver in 5-grain (0.333 gm.) to 32 c.c. of water solution applied to roots of lashes. Benzin may be used to soften and remove crusts.

**Prognosis.**—Favorable.

**Stye (Hordeolum).**—**Definition.**—Localized inflammation of the connective tissue of the tarsal cartilages.

**Symptoms.**—Local swelling, with redness, pain, tenderness.

**Treatment.**—Hot-water compresses; puncture; wash with a 10- or 20-grain boric-acid solution. Constitutional, tonics.

**Prognosis.**—Favorable.

**Abscess of the Lid.**—**Etiology.**—Traumatism with infection.

**Symptoms.** Swelling, redness, pain, tenderness, watering of the eye, fever.

**Treatment.** Free incision, irrigate with hydrogen-dioxid solution (10 to 40 per cent.), bichlorid (1 : 3000), drainage.



FIG. 392.—Eyelid everted for examination of its under surface and the upper part of globe (de Schweinitz).

**Prognosis.** Guarded. Sloughing may occur, followed by extensive scar-tissue formation and contraction, with inability to close the eyes (lapophthalmus), eversion of the lid (ectropion).

**Chalazion (Tarsal Cyst).**—**Definition.**—A small tumor caused by chronic inflammation of a meibomian gland.

**Symptoms.**—A small hard tumor of the lid (split-pea to olive-size), containing a gelatinous mass or pus; the overlying skin is freely movable.

**Treatment.**—Under cocain anesthesia, incision through the skin; careful dissection; close the wound by suture.

**Implements.**—Small, sharp-pointed knife, retractor, tenacu-

lum, fine needle. When ulceration through the conjunctiva has occurred, express the contents, curet or cauterize (silver nitrate) the sac.

**Prognosis.**—Favorable if entirely removed.

**Phthiriasis.**—**Definition.**—Infection of the ciliary borders with the ova of crab-lice.

**Treatment.**—Cleanse with hot water, bichlorid solution (1 : 3000); apply dilute citrine or ammoniated mercury ointments.

**Trichiasis.**—**Definition.**—Inversion of the eye-lashes.

**Distichiasis.**—Characterized by two rows of cilia, one pointing outward, the other drawn against the eyeball.

**Etiology.**—Contraction after traumatism.

**Treatment.**—Epilation, removal with forceps (temporary relief); ciliary transplanting (fine needle, threaded double, passed through the skin close to the lash affected; draw the



FIG. 393.—Wharton Jones' operation for ectropion.



FIG. 394.—Edges of wound brought together in a Y.

displaced lash through a needle puncture by means of a suture loop); electrolysis (galvanic current); plastic operation (dissection of a narrow strip of skin from the outer edge of the lid, suture).

**Entropion.**—**Definition.**—A condition in which the entire edge of the lid is turned inward (skin-surface against the eyeball). **Etiology.**—Spasmodic (blepharospasm) after enucleation of the eyeball, cataract operations, chronic con-



conjunctivitis. **Treatment.**—Spasmodic form by application of collodion; grooving the tarsal cartilage by a V-shaped excision; passage of silk sutures longitudinally through the skin surface and the ciliary margins allowing them to cut through by ulceration.

**Ectropion.**—**Definition.**—Eversion of the lids. **Etiology.**—Senility, purulent conjunctivitis, chronic inflammation, scar-tissue contraction. **Treatment.**—(a) When senile, mild astringent washes; (b) from swelling of the conjunctiva (palpebral paraphimosis), hot-water compresses, scarification, bandage; (c) contracted scar, when small, separate the scar by a V-shaped incision, transfer it into a Y by suturing; dissection with skin-grafting (Figs. 393, 394).

**Prognosis.**—Guardedly favorable.

**Ptosis.**—**Definition.**—Falling of the upper lid.

**Etiology.**—Congenital; inflammatory swelling; traumatism (levator muscle, third nerve).

**Treatment.**—Introduction of longitudinally placed sutures (act by cicatricial contraction); elastic band attached by collodion or adhesive plaster to lid and forehead; elliptic excision of skin (shortens the lid).

**Lagophthalmos (Hare-eye).**—**Definition.**—Inability completely to close the eyelids. **Etiology.**—Paralysis of seventh nerve; cicatricial contraction; goiter. **Treatment.**—Tarsorrhaphy (dissection of the outer canthus; unite with sutures). **Implements.**—Small, sharp-pointed knife, scissors, toothed forceps, tenaculum.

**Prognosis.**—Guardedly favorable.

**Exophthalmos.**—**Definition.**—Protrusion of the eyeball.

**Etiology.**—Exophthalmic goiter (edema of fat-tissue); periostitis; cellulitis; panophthalmitis; new growths.

**Treatment.**—Local or general, according to cause.

**Enophthalmos.**—**Definition.**—Sinking-in of the eyeball.

**Etiology.**—Chronic cellulitis.

**Treatment.**—Local; tonics.

**Prognosis.**—Guarded.

**Cryptophthalmos.**—**Definition.**—Congenital union of the eyelids associated with malformed eyes.

**Treatment.**—Plastic operation.

**Ankyloblepharon.**—**Definition.**—Partial or complete adhesion of the margins of the eyelids.

**Symblepharon.**—**Definition.** Partial or complete union of the conjunctiva of the lids and eyeball.

**Etiology.**—Traumatism (burns, metal, lime).

**Treatment.**—Dissection; close surface by suture.

**Prognosis.**—Guarded.

**Coloboma.**—**Definition.**—Congenital fissure of the eyelid.

**Treatment.**—Dissection of edges, suture.

**Prognosis.**—Favorable.

**Epicanthus.**—**Definition.**—Congenital malformation giving rise to concentric overlapping of skin about the inner canthus.

**Treatment.**—May disappear spontaneously; excision.

**Prognosis.**—Favorable.

**Black Eye (Ecchymosis; Contusion of Eyelid).**—

**Treatment.**—Ice or hot compresses, massage, aspiration, leeching.

**Prognosis.**—Favorable.

## CONJUNCTIVA.

**Inflammation.**—May be acute or chronic (catarrhal conjunctivitis, hyperemia of the conjunctiva).

**Etiology.**—Exposure; irritation—foreign body, drugs (atropin, cocain); epidemic (pink eye); eye-strain.

**Symptoms.**—Sensation as of dust in the eyes; heat; smarting pain; injection; stiffness of the lids; slight photophobia; increased secretion (lacrimal, mucopurulent).

**Treatment.**—Rest (shade, dark glasses); hot- or cold-water douches; mild astringent lotions (alum, zinc sulphate); instillation of 2-grain (0.1333 gm.) solution of nitrate of silver; 10-grain (0.1666 gm.) boric-acid solution; bichlorid (1:10,000); remove the cause. Constitutional, tonics:

R. Sod. chlorid. . . . . gr. xv (1 gm.).  
 Acid. bor. . . . . gr. xx (1.3 gm.).  
 Aquæ . . . . . f℥ij (64 c.c.).

M. Sig.—Eye-wash; use with a dropper or an eye-bathing glass three times daily.

- R. Acid, boric. . . . . gr. x (0.666 gm.).  
 Cocain. hydrochlor. . . . . gr. ss (0.033 gm.).  
 Aquæ . . . . . f $\overline{5}$ j (32 c.c.).
- M. Sig.—Drop in each eye three times daily for simple catarrhal conjunctivitis.

**Prognosis.**—Favorable.

**Phlyctenular Conjunctivitis (Papular Ophthalmia; Strumous Ophthalmia)** (Fig. 395).—Characterized by photophobia, injection, vesicle formation; ulcers may



FIG. 395.—Phlyctenular conjunctivitis (de Schweinitz).



FIG. 396.—Hypopyon, or a collection of pus in the anterior chamber (de Schweinitz).

result, with deposition of pus between the layers of the cornea (unguis), accumulation of pus within the anterior chamber (hypopyon) (Fig. 396).

**Treatment.**—Rest (dark glasses, shade); boric-acid wash; instillation of atropin, cocain (for pain); powdered calomel dusted into the eye; yellow oxid of mercury 2 to 8 grains (0.1333–0.532 gm.) to ounce (32 gm.) of vaselin.

**Prognosis.**—Guarded.

**Purulent Conjunctivitis (Purulent Ophthalmia; Ophthalmia Neonatorum of New-born).**—Characterized by rapidly developing, high grade of inflammation, accompanied by profuse mucopurulent discharge and corneal ulceration.

**Etiology.**—Gonorrheal infection.

**Treatment.**—Prophylaxis: Protect the other eye by a watch-glass shield; wash the infant's eyes with water immediately after delivery.

- R. Argent. nitrat. . . . . gr. x (0.666 gm.).  
 Aquæ dest. . . . . f $\overline{5}$ j (32 c.c.).
- M. Sig.—Instil one or two drops in both eyes as soon as the child is born (Credé method).



Active: Rest; hot compresses; douching every one to three hours with bichlorid solution (1 : 10,000).

R. Protargol (20 per cent.) . . . . . gr. 96 (6.399 gm.).

Aque . . . . . f $\overline{5}$ j (32 c.c.).

M. Sig.—Instil several drops every two hours in purulent discharges from the eyes. May be used continuously without harm (no caustic effects).

Instillation of atropin; when discharge has lessened, apply 10-grain (0.666 gm. in 32 c.c. of water) nitrate-of-silver solution (control by common salt solution); gradually decrease strength; alum; ointment of yellow oxid of mercury; opium for pain; salines.

**Prognosis.**—Always guarded.

**Croupous Conjunctivitis (Membranous Conjunctivitis).**—Characterized by mucopurulent discharge with false-membrane formation (organized exudate).

**Treatment.**—Remove the membrane; hot-water irrigation; boric-acid wash.

**Prognosis.**—Favorable.

**Diphtheric Conjunctivitis.**—Gives rise to firm, hard swelling of the lids with scanty seropurulent or serous discharge, accompanied by ulceration or perforation of the cornea.

**Treatment.**—Hot-water or ice compresses; irrigation with boric-acid solution; instillation of atropin; application of 10-grain (0.666 gm. in 32 c.c. of water) nitrate-of-silver solution; glycerol of tannin. Constitutional: Tonics and supportive.

**Prognosis.**—Guardedly unfavorable.

**Trachoma (Granular Conjunctivitis)** (Fig. 397).—May occur as: (a) Thickening of tarsal conjunctiva with exudation (contagious) and development of the papillæ (chronic blennorrhæa); (b) development of sago-like bodies within the tarsal conjunctiva and retrotarsal folds.

**Symptoms.**—Burning or itching, swelling, discharge (mucopurulent), velvety appearance of conjunctiva; remission of the disease may occur, with subsequent return of symptoms, formation of blood-vessels within the cornea (pannus), alteration of granules into fibrous tissue, with

contraction of conjunctival sac and change so that the membrane sheds water (xeroma).

**Treatment.**—Expression of the individual granules; instillation of silver nitrate, glycerol of tannin, zinc sulphate;



FIG. 397.—Follicular trachoma (Johnson).

irrigation with bichlorid (1:10,000), ointment of yellow oxid of mercury; instillation of  $2\frac{1}{2}$  grains (0.166 gm.) infusion of jequirity, circumcision of the cornea (peritomy) for pannus. Constitutional: tonics.

**Prognosis.**—Always guarded.



FIG. 398.—Pterygium.

**Pterygium** (Fig. 398).—**Definition.**—Union of a fold of the bulbar conjunctiva with the cornea. Occurs commonly upon the nasal side as a fan-shaped projection (apex toward the cornea) if vascular growth is progressive.

**Treatment.**—Dissection from the cornea, transplanting the flap by suturing (after incising to the lower border of the conjunctiva).

**Prognosis.**—Favorable.

**Pinguecula.**—**Definition.**—A small yellowish elevation occurring in the conjunctiva.

**Etiology.**—Senile degeneration associated with external irritation.

**Treatment.**—Excision.

**Prognosis.**—Favorable.

**Lupus.**—May be primary or secondary by extension.

**Treatment.**—Excision, curettage, cauterization (silver nitrate, cautery). Constitutional: tonics.

**Prognosis.**—Guarded.

**New Growths.**—**Cysts (Dermoid); Epithelioma; Sarcoma.**—**Implements.**—Toothed forceps, small sharp-pointed knife, scissors, tenaculum, cautery.

**Treatment.**—Excision.

**Prognosis.**—Guarded.

**Foreign Bodies.**—Remove by moistened end of handkerchief, wisp of cotton twisted upon a probe or matchstick. Evert the upper lid by turning outward and upward upon the finger-tip or end of a small flat object (hair-pin).

Remove steel particles with a magnet if embedded; treat lime-burns by irrigation with rapid running water, instillation of weak vinegar solution, olive or sweet oil; remove the particles.

## LACRIMAL APPARATUS.

**Inflammation of Lacrimal Sac (Dacryocystitis); Mucocele (Chronic Form).**—**Symptoms.**—Pain, swelling, tenderness, increased secretion (watery, mucoid, mucopurulent) abscess formation, fistula.

**Treatment.**—Hot fomentations; dilate canals (probes, canaliculi knife (Fig. 399); astringent wash; silver nitrate; dissection through the outer third of the brow, reach gland, remove with toothed forceps and tenaculum).

**Prognosis.**—Favorable.



**Epiphora.**—**Definition.**—Excessive lacrimation.

**Etiology.**—Reflex (ametropia), eversion of puncta, cyanosis of nasal duct.



FIG. 399.—Introduction of lacrimal probe.

**Implements.**—Small probe-pointed knife (canaliculi knife), probes.

**Treatment.**—Dilatation by incision and with probes of canaliculi and nasal duct.

#### CORNEA.

**Foreign Bodies.**—Examine by reflected light (lens); remove with moistened handkerchief; wisp of cotton upon a match-stick, magnet (metal particles); irrigation.

Finely powdered calomel, iodoform, or protargol may be dusted over corneal conjunctiva or cutaneous wounds about the eye.

**Keratitis ; Corneitis.**—**Definition.**—Inflammation of the cornea.

**Etiology.**—Malnutrition ; malaria ; tuberculosis ; syphilis rheumatism.

**Symptoms.**—Burning, pain, photophobia, lacrimation, dimness of vision, spasm of eyelids, pink coloring in ciliary

region (circumcorneal zone), haziness of cornea, ulceration.

**Treatment.**—Rest (shade, dark glasses); irrigation with boric-acid solution, hot or cold compresses, leeching, instillation of atropin. Constitutional: Salines, tonics; treat the diathesis.

**Prognosis.**—Guarded.

**Chronic Interstitial Keratitis.**—**Definition.**—A chronic, non-suppurative inflammation of the cornea, commonly due to syphilis.

**Symptoms.**—Manifested by a universal haziness. Slow course, begins at the margin: enlargement of ciliary blood-vessels may occur (salmon patch, vascular keratitis).

**Complications.**—Iritis, glaucoma.

**Treatment.**—Instillation of atropin; ointment of yellow oxid of mercury; leeching (for iritis). Constitutional: Inunction of mercurial ointment; potassium iodid.

**Prognosis.**—Guardedly favorable.

**Phlyctenular Keratitis.**—**Definition.**—A manifestation of phlyctenular ophthalmia, giving rise to minute corneal vesicles which burst, forming little ulcers.

**Treatment.**—Rest (shade, dark glasses); irrigation with bichlorid solution (1 : 10,000); instillation of atropin, cocain (for pain and photophobia); dust with powdered calomel; yellow oxid of mercury ointment.

**Prognosis.**—Guarded.

**Simple Ulcer (Non-suppurating Corneal Ulcer).**

—**Etiology.**—Conjunctivitis, traumatism, debility, senility, epiphora.

**Diagnosis.**—By inspection; margins are transparent; no discharge.

**Treatment.**—Boric-acid wash; dusting with powdered calomel.

**Prognosis.**—Guardedly favorable.

**Herpetic Ulcers.**—May occur during an attack of herpes zoster.

**Treatment.**—Hot-water fomentations; boric-acid wash; powdered calomel.

**Prognosis.**—Guardedly favorable.

**Suppurative Keratitis.**—**Definition.**—Formation of pus between the layers of the cornea, discharging externally.

**Etiology.**—Traumatism; secondary to other eye diseases.

**Symptoms.**—Pain, swelling, discharge (mucopurulent), local haziness, dimness of vision; photophobia (extreme sensitiveness to light).

**Treatment.**—Hot or cold compresses; irrigation with boric acid; instillation of atropin, cocain (for pain), compression bandage.

**Prognosis.**—Guarded.

**Complications.**—(a) *Corneal Abscess.*—Collection of pus within the cornea.

*Treatment.*—Free incision; irrigation; treat the remaining suppurating ulcer.

(b) *Corneal Fistula.*—*Treatment.*—Compression bandage, nitrate of silver (caustic), red-hot probe, iridectomy.

*Implements.*—Speculum, toothed forceps, keratome, scissors, hook, iris-forceps, spatula.

*Method.*—Cocain anesthesia; irrigation with bichlorid (1 : 10,000); retract lids; grasp tissue near corneal border; insert keratome opposite point of protruded iris; draw out and incise portion of iris (hook, iris-forceps, and scissors), close wound; remove speculum; irrigate; massage the eyeball or replace iris with spatula; instil atropin; apply gauze dressing and bandage.

(c) *Anterior Central Capsular Cataract.*—*Definition.*—Organized lymph remaining upon the capsule after corneal fistula has taken place.

(d) *Protrusion of the Iris through Corneal Opening (Pro-lapse of the Iris).*—*Treatment.*—Compression bandage.

(e) *Anterior Synechia.*—*Definition.*—Adherence of iris to inner surface of the cornea.

(f) *Staphyloma.*—*Definition.*—Forward projection of the front of the eye.

*Treatment.*—Compression bandage; instillation of atropin; puncture through the floor of the ulcer with a needle or small, sharp-pointed knife (paracentesis); iridectomy; abscission.

*Method.*—Cocain anesthesia; transfix with sharp-pointed



knife at the junction of upper and middle thirds; cut through downward; complete excision with scissors; allow the wound to granulate.

*De Wecker's Method for Complete Staphyloma.*—Cocain anesthesia; dissection of the conjunctiva from the anterior portion of the globe and passage of sutures; remove the

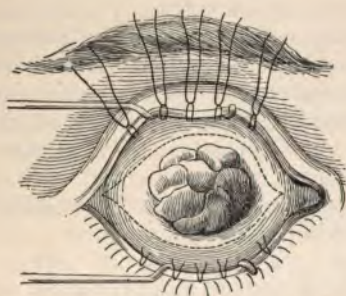


FIG. 400.—Critchett's operation for staphyloma.

staphyloma by excision; remove the crystalline lens; suture the conjunctiva. Tattooing to represent the pupil may be performed after healing.

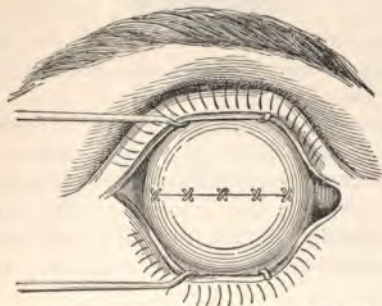


FIG. 401.—Stump after Critchett's operation for staphyloma.

*Critchett's Method* (Figs. 400, 401).—Cocain anesthesia; consists in passing four or five long curved needles threaded

with silk through the sclera at points midway between the base of the staphyloma and the insertions of the muscles; transfix laterally; dissect off the staphyloma; tie the sutures after approximating the cleft surfaces.

*Evisceration for Complete Staphyloma.*—*Implements.*—Sharp-pointed knife, toothed forceps, speculum, needles, scissors, curet.

*Method.*—General anesthesia; retract eyelids; transfix cornea with sharp-pointed knife; cut through the cornea at sclerocorneal junction; complete corneal removal with scissors; remove contents of globe with curet; irrigate with bichlorid solution (1 : 10,000); suture edges of wound.

*Mule's Method.*—Consists in the introduction of a glass sphere after clearing out the eyeball.

*Enucleation (Vienna Method)* (Fig. 402).—*Implements.*—Scissors, toothed forceps, speculum.



FIG. 402.—Enucleation of an eyeball.

*Method.*—General anesthesia; divide the conjunctiva over the insertion of the internal rectus muscle; divide the tendon; grasp the globe attachment (forceps); complete dissection by dividing the inferior rectus, superior rectus, optic nerve, external rectus, and oblique muscles; irrigate with warm water or boric-acid solution; dressing, light gauze, bandage.

*Bonnet's Method.*—*Implements.*—Sharp-pointed knife, scissors, speculum, hook.

*Method.*—General anesthesia; retract the eyelids; separate the conjunctiva at scleral junction; divide recti muscles;

divide optic nerve; complete removal by scissors' dissection of the remaining soft parts; irrigate with bichlorid (1 : 10,000).

*Dressing.*—Gauze, bandage.

**Neuroparalytic Keratitis.**—**Definition.**—Corneal inflammation due to external irritation after paralysis of the trigeminal nerve.

**Treatment.**—Irrigation with boric-acid solution; bandage; suture the eyelids.

**Prognosis.**—Guardedly unfavorable.

**Keratitis Bullosa.**—Rare. Characterized by formation of blebs filled with clear fluid upon the cornea.

**Treatment.**—Cleanliness of the eye (boric-acid solutions); drain the blebs; tonics.

**Prognosis.**—Guarded.

**Arcus Senilis (Gerontoxon).**—**Definition.**—Senile fatty degeneration of the corneal fibers, giving rise to a gray arc running parallel to the limbus (conjunctival border).

**Keratoconus (Staphyloma Pellucidum).**—**Definition.**—Conic cornea.

**Etiology.**—Unknown.

**Symptoms.**—Dimness of vision; myopia.

**Treatment.**—Glasses; cauterization of apex (silver nitrate); shaving the apex (sharp-pointed knife); iridectomy; iridosis.

**Method.**—**Implements.**—Sharp-pointed knife, toothed forceps, spatula, hook, needle, speculum.

**Method.**—Cocain anesthesia; incision through the cornea just inside the limbus into the anterior chamber; draw a portion of the iris through the wound; ligate in this position; excise after forty-eight hours or allow loop of projected iris to persist.

**Constitutional Treatment.**—Tonics; improve the hygiene.

**Prognosis.**—Guarded.

**Corneal Opacity.**—May be slight (nebula); recognition in daylight (macula); dense white discoloration (leukoma).

#### ARTIFICIAL EYES.

Patient should possess duplicates (prevents wear); should not be worn continuously until two months after operation.



## SCLERA.

**Scleritis; Episcleritis.**—**Definition.**—Inflammation of the sclera, giving rise to areas of dark-red hyperemia about the corneal border.

**Etiology.**—Traumatism, diatheses.

**Symptoms.**—Pain, burning, injection, photophobia.

**Treatment.**—Cauterization. Constitutional: Treat the diatheses; improve the hygiene; tonics.

## IRIS; CILIARY BODY; CHOROID.

**Iritis.**—**Definition.**—Inflammation of the iris.

**Etiology.**—Traumatism; diatheses; secondary extension of inflammation of other parts.

**Symptoms.**—Pain; blurring sight; photophobia; pericorneal injection; sluggish movement; change in color of the iris.

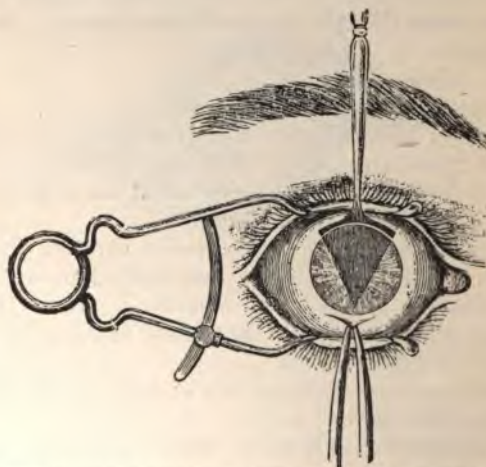


FIG. 403.—Operation of iridectomy: keratome within the anterior chamber.

**Complications.**—Adhesions of the iris to the lens capsule (posterior synechia).

**Treatment.**—Rest (shade, dark glasses); instillation of atropin (one-drop doses of 1 per cent. solution); hot-water

compresses; leeching; paracentesis; iridectomy. Treat the diathesis.

**Prognosis.**—Guarded. Danger of sympathetic inflammation of the other eye.

**Cyclitis.**—**Definition.**—Inflammation of the ciliary body. Is apt to be associated with iritis.

**Symptoms.**—Eye red and watery, marked ciliary injection, pain, tenderness, infiltration (lymph, pus) of the vitreous humor may occur; degeneration or organization of lymph may occur.

**Treatment.**—Enforced rest (shade, dark glasses); irrigation with boric-acid solutions; instillation of atropin, eserin; leeching; hyoscin (for pain); iridectomy (Figs. 403, 404), including the lens after acute inflammation has passed. Constitutional: Salines, sudorifics, mercury, potassium iodid.

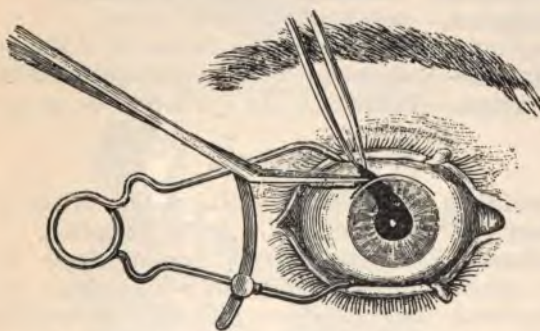


FIG. 404.—Iridectomy (removal of a portion of the iris).

**Prognosis.**—Always guarded. Danger of sympathetic ophthalmia.

**Argyll-Robertson Pupil.**—**Definition.**—A pupil which, while accommodating for distance, fails to respond to light. Occurs in locomotor ataxia, paresis.

**Aphakia.**—**Definition.**—Condition of high degree of hypermetropia produced by absorption or extraction of the crystalline lens.

**Nystagmus.**—**Definition.**—Tremor of the eyeball.

**Etiology.**—Congenital; occupation (miners); disease of basal ganglia; middle-ear disease.

**Treatment.**—Treat the cause.

**Prognosis.**—Guarded.

**Astigmatism.**—**Definition.**—A condition in which homocentric light is not gathered to a central focus.

**Ametropia.**—**Definition.**—Want of normal refraction power; may be due to myopia, hypermetropia, presbyopia, astigmatism.

**Hypermetropia.**—**Definition.**—Far-sighted (parallel rays focused behind the retina).

**Myopia.**—**Definition.**—Near-sighted (parallel rays focused in front of the retina).

**Presbyopia.**—**Definition.**—Senile loss of accommodation.

**Ambiopia.**—**Definition.**—Double vision.

**Amblyopia.**—**Definition.**—Dimness of vision.

**Amaurosis.**—**Definition.**—Loss of vision.

**Corectopia.**—**Definition.**—Displacement of the pupil.

**Copiopia.**—**Definition.**—A fatigued condition of the eyes.

**Collyrium.**—**Definition.**—An eye-lotion or an eye-salve.

#### CHOROID.

**Choroiditis.**—**Definition.**—Inflammation of the choroid.

**Etiology.**—Traumatism, diathesis, by extension.

**Symptoms.**—Pain, tenderness, burning, eye red and watery, exudation of lymph (fawn-colored or yellowish discolorations) upon the eye-ground demonstrable with ophthalmoscope; purulent infiltration of the choroid and surrounding tissues (panophthalmitis) may occur.

**Treatment.**—Enforced rest, instillation of atropin; hot fomentations; boric-acid irrigations; paracentesis.

**Prognosis.**—Guardedly unfavorable, sympathetic inflammation of other eye prone to occur.

#### RETINA.

**Retinitis.**—**Definition.**—Inflammation of the retina.

**Etiology.**—Traumatism, diatheses, diabetes, by extension.

**Symptoms.**—Pain, tenderness, dimness of vision.



**Diagnose** by ophthalmic examination (Figs. 405, 406) and by history.



FIG. 405.—Ophthalmoscopic examination. Method of the upright image. Observer and patient in the correct position (de Schweinitz).



FIG. 406.—Method of indirect examination with the ophthalmoscope (de Schweinitz).

**Treatment.**—Rest, irrigation with boric-acid solutions, instillation of atropin, paracentesis, iridectomy. Constitutional : Treat the diathesis, sudorifics, salines.

**Prognosis.**—Guardedly unfavorable.

**Sympathetic Ophthalmia (Sympathetic Ophthalmitis).**—**Definition.**—Inflammatory reaction in one eye due to a primary inflammation of the other.

**Treatment.**—Early evisceration or enucleation of the eye first affected.

**Prognosis.**—Guardedly favorable.

#### VITREOUS.

**Hyalitis.**—**Definition.**—Inflammation of the vitreous humor.

**Etiology.**—Traumatism by extension.

**Diagnosis.**—Infiltration (lymph, serum, pus) within the



FIG. 407.—Position of hands in determining the tension of an eyeball (de Schweinitz).

vitreous humor manifested as fine clouding, filaments (floculi) giving rise to projection of opacities upon the retina (myodesopia).

**Treatment.**—Rest (shade, dark glasses), irrigation with boric-acid solution, instillation of atropin; leeching. Constitutional: Salines, sudorifics, potassium iodid, mercury.

**Prognosis.**—Guardedly unfavorable.

**Glaucoma.**—**Definition.**—A group of symptoms due to increased intra-ocular tension.

**Etiology.**—Obscure; predisposing causes are debility, late middle life, hypermetropia.

**Symptoms.**—Abnormal hardness of the eyeball (demonstrated by palpation through the closed lids) (Fig. 407); sudden or gradual loss of field of vision (haziness of the cornea, contraction of the pupil); fulness of anterior scleral veins; pericorneal purplish discoloration; pain may be absent (sometimes agonizing).

**Treatment.**—Iridectomy; sclerotomy.

**Method.**—Transfixion with a sharp-pointed knife (acts by relieving pressure).

**Prognosis.**—Guardedly favorable. Internal hemorrhage may cause failure.

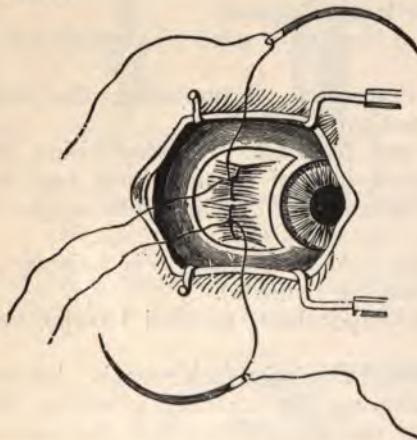


FIG. 408.—Advancement of external rectus.

**Strabismus (Squint).**—**Definition.**—Deviation of visual axes. May be: (a) Convergent (cross-eye), visual axes meet before reaching the object looked at; (b) divergent, meet beyond the object.

**Etiology.**—Congenital, ametropia, traumatism, central nervous disease.

**Implements.**—Speculum, sharp-pointed knife, scissors, toothed forceps, hooks, needles.



**Treatment.**—Corrective glasses; tenotomy.

**Method.**—Cocain anesthesia; incise conjunctiva over the tendon insertion; clear the tendon with hooks; divide (complete or partial); advancement of rectus muscle (Fig. 408).

**Method.**—Vertical incision through the conjunctiva the width of the tendon; divide and advance tendon by suturing to the conjunctiva. Division of antagonizing tendon may be necessary. A vertically placed pulley-suture passed through the conjunctiva, capsule of Tenon, and episcleral tissue may be used as a stay for the tendon suture.

**Prognosis.**—Guardedly favorable. Best to operate before puberty.

**Cataract.**—**Definition.**—Partial or complete opacity of the crystalline lens or capsule.

May be: (a) Hard; (b) soft; (c) central; (d) peripheral; (e) capsular.

**Etiology.**—Congenital, traumatism, diatheses, debility, senility, traumatism.

**Symptoms and Diagnosis.**—Blurring vision (*muscæ volitantes*); gradual loss of vision; vision best in dull light (due to contracted pupil). Ophthalmoscopic examination appearance.

**Complications.**—Accompanying eye disease; secondary cataract (incomplete removal).

**Implements.**—Speculum, toothed forceps, needle (Bowman's stop).

**Treatment.**—(a) *Discission* (scleronyxis; keratonyxis) consists in puncturing the capsule, admitting the aqueous humor, which causes absorption of the cataract. Applicable in children and young adults.

**Method.**—Cocain anesthesia; dilate pupil with atropin; irrigation with boric acid or bichlorid (1:10,000); retract eyelids; fix eyeball with forceps applied to conjunctiva upon the nasal side of the cornea; enter needle from below upward and inward until lens-capsule is pierced; enlarge capsule opening by rotating the needle to secure entrance of aqueous humor; irrigate.

**Dressing.**—Light gauze and bandage.

**After-treatment.**—Enforced rest in darkened room.

(b) *Extraction.*—Removal of the lens. *Implements.*—Speculum, sharp-pointed knife, toothed forceps, wire loop, spatula, iris-forceps (Figs. 409-413).



FIG. 409.—Cataract knife.



FIG. 410.—Cystotome.



FIG. 411.—Capsule forceps.



FIG. 412.—Metal spoon.



FIG. 413.—Wire loop for extraction of lens.

*Method.*—Cocain anesthesia; head slightly elevated; irrigation with boric-acid solution; iridectomy may be performed

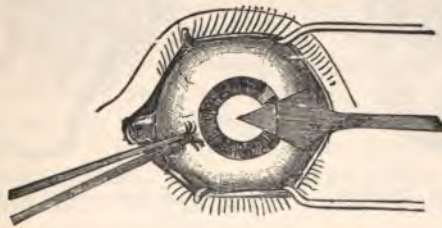


FIG. 414.—Linear extraction: knife entered in horizontal meridian of cornea about 4 mm. from outer margin.

as a preliminary; incise the capsule; remove lens with wire loop or by massage (Fig. 414).

**Prognosis.**—Guarded.

**MEMBRANA TYMPANI (Drum-head).**

**Inflammation (Myringitis).—Etiology.**—Traumatism (cold air, water).

**Symptoms.**—Lancinating pain, swelling, redness, slight discharge (watery, bloody, purulent).

**Treatment.**—Dry heat, scarification, cups, leeching, saline purgation.

**Prognosis.**—Guardedly favorable.

**Rupture of the Drum-head.—Etiology.**—Traumatism.

**Symptoms.**—Pain, tinnitus aurium, altered hearing.

**Treatment.**—Plug the external ear with a cotton pledget.

**Prognosis.**—Favorable.

**MIDDLE EAR.**

**Inflammation.**—(a) Catarrhal otitis media, non-perforating; due to extension of catarrh from the nasopharynx; (b) purulent otitis media, perforating; may follow catarrhal form (rare), exanthemata.

**Symptoms.**—Earache, fever, discharge. Examination by speculum and strong illumination (head mirror) reveals bulging of the drum-head, intense congestion of tympanic membrane.

**Treatment.**—*Acute Attack.*—Hot water (105° to 120° F.—40.5° to 48.8° C.), douching, dry heat, artificial perforation of the drum-head (paracentesis).

*Method.*—General anesthesia.

*Implements.*—Small sharp-pointed knife (paracentesis knife); perforate freely most prominent part; drain (gauze). Frequent douching.

*Chronic.*—Treat the nasopharynx; dilate the Eustachian tube (catheter); practise inflation; hot-water syringing; paracentesis; excision (diseased membrane and ossicles, "attic cases"); careful cleansing of the ear. Insufflation of boric acid (dry treatment) useful in chronic catarrhal cases.

**Complications.**—Necrosis of the mastoid cells, periostitis of the mastoid process.

**Diagnosis.**—Sudden acute attack of inflammation with marked increase in the symptoms during the course of the



chronic affection. Tenderness upon deep pressure over the mastoid process. Brain symptoms (headache), vertigo, tinnitus aurium, intolerance to light and sound, delirium, coma.

**Treatment.**—Drainage of the mastoid cells.

**Implements.**—Scalpel, scissors, dissecting forceps, hemostats (4), retractors (sharp-pointed), chisel; mallet, osteotome, probe, trephine, rongeur forceps, sand-bag.

**Method.**—General anesthesia; incision; curved across the mastoid process having the ear retracted forward. (Fig. 417).

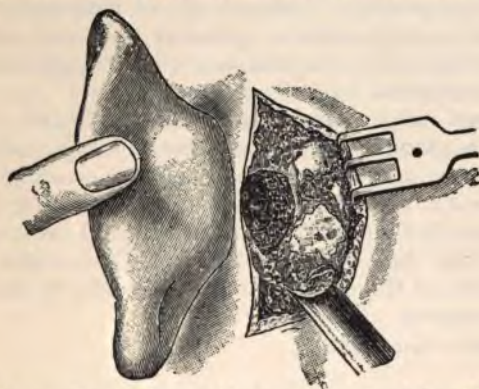


FIG. 417.—Opening the mastoid antrum (Esmarch and Kowalzig).

Entrance to the cells may be gained through the "supramental triangle" formed by the posterior root of the zygoma, the upper and posterior margin of the external bony meatus of the ear, and a nearly perpendicular line joining these two. Retract soft parts; reach bone; avoid facial nerve; open the mastoid by chisel and mallet, osteotome, or small trephine; drain.

**Dressing.**—Gauze, bandage.

**Prognosis.**—Guardedly favorable.

**Sinus Thrombosis.**—**Diagnosis.**—Acute exacerbation with chills, localized headache and pain, tenderness upon deep pressure over the mastoid process, choked disc, general symptoms of pyemia.

**Treatment.**—Open and drain the mastoid cells; expose the lateral sinus by trephining. Guide: Line drawn from the external auditory meatus to theinion. Control hemorrhage by packing; ligate internal jugular vein, carotid artery if necessary; drain.

**Dressing.**—Gauze, cotton, bandage.

**Prognosis.**—Guarded.

**Cerebral Abscess.**—**Diagnosis.**—Sudden cessation of discharge from the ear; fever, nausea, vomiting, pain in mastoid, headache (general or frontal), coma, optic neuritis, localizing symptoms. Common site of abscess in "dangerous region," a circle with a radius of one and one-quarter inches with a center one and one-quarter inches above and behind the external auditory meatus.

**Treatment.**—Open and drain the mastoid cells; trephine the skull, beginning at a point one and one-quarter inches above and behind the external auditory meatus; probe or drain. Reach cerebellar regions by trephining at a point one and one-half inches behind the external auditory meatus and one inch below Reid's base line (line drawn from the lower border of the orbit through the center of the external auditory meatus).

**Prognosis.**—Guarded.

#### MECHANICAL EAR APPLIANCES.

All forms of metallic resonators are injurious; a cotton pledget is the most satisfactory.

Well-fitting ear trumpets may be used without danger.

#### METHODS OF INFLATING THE TYMPANUM.

Clean the nasopharynx as a preliminary (spray, cotton swabbing). Massage the middle ear; have the patient suck in an out of a stethoscope, having the ear-pieces inserted in in his own ears, the receiver replaced by a mouth-piece.

**Mechanical Inflation.**—(a) **Politzer's Method.**—Project air into both tympanic cavities by means of forcible compression of a Politzer bag (air-bulb syringe held in air by

closing the opposite nare) at the moment of swallowing (Eustachian tube becomes patent).

(b) **Gruber's Method.**—Have the patient pronounce the word "huck" at the instant of compression of the bulb.

(c) **Holt's Method.**—Puffing out the cheeks with air at the moment of bulb compression.

(d) **Valsalva's Method.**—For self-inflation: Patient holds mouth and nose closed and by compression forces air into the middle ear. Caution: causes cerebral congestion.

(e) **One-sided Inflation.**—Pass Eustachian catheter through nares of same side along the floor of the nose to the wall of the pharynx (beak pointing downward); rotate and enter the faucial mouth of Eustachian tube. Inflate with a Politzer bag. Employ an auscultation tube (rubber tubing three feet long fitted with ear-pieces at both ends); insert one end in patient's external auditory meatus the other in operator's.





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